

## SEQUENCE LISTING

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<120> FILAMENTOUS FUNGAL MUTANTS WITH IMPROVED HOMOLOGOUS RECOMBINATION EFFICIENCY

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<170> PatentIn version 3.1

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acaagatacg ttacataaag cagtactact tgtttcaaac tgtgtacaca ccagggctct 3900
cgcttcagcg gagagtgtcg aaagattcag taaaacatcg ccaggggtga tggaaagggg 3960
ttaag

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&lt;210&gt; 10

&lt;211&gt; 1497

&lt;212&gt; DNA

<213> *Aspergillus niger*

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1) .. (1497)

&lt;400&gt; 10

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Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala Ala
1 5 10 15
cct gct ttg gct gca acg cct gcg gac tgg cga tcg caa tcc att tat 96
Pro Ala Leu Ala Ala Thr Pro Ala Asp Trp Arg Ser Gln Ser Ile Tyr
20 25 30
ttc ctt ctc acg gat cga ttt gca agg acg gat ggg tcg acg act gcg 144
Phe Leu Leu Thr Asp Arg Phe Ala Arg Thr Asp Gly Ser Thr Thr Ala
35 40 45
act tgt aat act gcg gat cag aaa tac tgt ggt gga aca tgg cag ggc 192
Thr Cys Asn Thr Ala Asp Gln Lys Tyr Cys Gly Gly Thr Trp Gln Gly
50 55 60
atc atc gac aag ttg gac tat atc cag gga atg ggc ttc aca gcc atc 240
Ile Ile Asp Lys Leu Asp Tyr Ile Gln Gly Met Gly Phe Thr Ala Ile
65 70 75 80
tgg atc acc ccc gtt aca gcc cag ctg ccc cag acc acc gca tat gga 288
Trp Ile Thr Pro Val Thr Ala Gln Leu Pro Gln Thr Thr Ala Tyr Gly
85 90 95
gat gcc tac cat ggc tac tgg cag cag gat ata tac tct ctg aac gaa 336
Asp Ala Tyr His Gly Tyr Trp Gln Gln Asp Ile Tyr Ser Leu Asn Glu

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|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| aac | tac | ggc | act | gca | gat | gac | ttg | aag | gcg | ctc | tct | tcg | gcc | ctt | cat | 384  |
| Asn | Tyr | Gly | Thr | Ala | Asp | Asp | Leu | Lys | Ala | Leu | Ser | Ser | Ala | Leu | His |      |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |      |
| gag | agg | ggg | atg | tat | ctt | atg | gtc | gat | gtg | gtt | gct | aac | cat | atg | ggc | 432  |
| Glu | Arg | Gly | Met | Tyr | Leu | Met | Val | Asp | Val | Val | Ala | Asn | His | Met | Gly |      |
|     | 130 |     |     |     |     |     | 135 |     |     |     | 140 |     |     |     |     |      |
| tat | gat | gga | gcg | ggt | agc | tca | gtc | gat | tac | agt | gtg | ttt | aaa | ccg | ttc | 480  |
| Tyr | Asp | Gly | Ala | Gly | Ser | Ser | Val | Asp | Tyr | Ser | Val | Phe | Lys | Pro | Phe |      |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |      |
| agt | tcc | caa | gac | tac | ttc | cac | ccg | ttc | tgt | ttc | att | caa | aac | tat | gaa | 528  |
| Ser | Ser | Gln | Asp | Tyr | Phe | His | Pro | Phe | Cys | Phe | Ile | Gln | Asn | Tyr | Glu |      |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     | 175 |     |     |     |      |
| gat | cag | act | cag | gtt | gag | gat | tgc | tgg | cta | gga | gat | aac | act | gtc | tcc | 576  |
| Asp | Gln | Thr | Gln | Val | Glu | Asp | Cys | Trp | Leu | Gly | Asp | Asn | Thr | Val | Ser |      |
|     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |     |      |
| ttg | cct | gat | ctc | gat | acc | acc | aag | gat | gtg | gtc | aag | aat | gaa | tgg | tac | 624  |
| Leu | Pro | Asp | Leu | Asp | Thr | Thr | Lys | Asp | Val | Val | Lys | Asn | Glu | Trp | Tyr |      |
|     | 195 |     |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |      |
| gac | tgg | gtg | gga | tca | ttg | gta | tcg | aac | tac | tcc | att | gac | ggc | ctc | cgt | 672  |
| Asp | Trp | Val | Gly | Ser | Leu | Val | Ser | Asn | Tyr | Ser | Ile | Asp | Gly | Leu | Arg |      |
|     | 210 |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |     |      |
| atc | gac | aca | gta | aaa | cac | gtc | cag | aag | gac | ttc | tgg | ccc | ggg | tac | aac | 720  |
| Ile | Asp | Thr | Val | Lys | His | Val | Gln | Lys | Asp | Phe | Trp | Pro | Gly | Tyr | Asn |      |
| 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |     |      |
| aaa | gcc | gca | ggc | gtg | tac | tgt | atc | ggc | gag | gtg | ctc | gac | ggg | gat | ccg | 768  |
| Lys | Ala | Ala | Gly | Val | Tyr | Cys | Ile | Gly | Glu | Val | Leu | Asp | Gly | Asp | Pro |      |
|     |     | 245 |     |     |     |     | 250 |     |     |     | 255 |     |     |     |     |      |
| gcc | tac | act | tgt | ccc | tac | cag | aac | gtc | atg | gac | ggc | gta | ctg | aac | tat | 816  |
| Ala | Tyr | Thr | Cys | Pro | Tyr | Gln | Asn | Val | Met | Asp | Gly | Val | Leu | Asn | Tyr |      |
|     | 260 |     |     |     | 265 |     |     |     |     |     | 270 |     |     |     |     |      |
| ccc | att | tac | tat | cca | ctc | ctc | aac | gcc | ttc | aag | tca | acc | tcc | ggc | agc | 864  |
| Pro | Ile | Tyr | Tyr | Pro | Leu | Leu | Asn | Ala | Phe | Lys | Ser | Thr | Ser | Gly | Ser |      |
|     | 275 |     |     |     | 280 |     |     |     |     |     | 285 |     |     |     |     |      |
| atg | gac | gac | ctc | tac | aac | atg | atc | aac | acc | gtc | aaa | tcc | gac | tgt | cca | 912  |
| Met | Asp | Asp | Leu | Tyr | Asn | Met | Ile | Asn | Thr | Val | Lys | Ser | Asp | Cys | Pro |      |
|     | 290 |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |     |      |
| gac | tca | aca | ctc | ctg | ggc | aca | ttc | gtc | gag | aac | cac | gac | aac | cca | cgg | 960  |
| Asp | Ser | Thr | Leu | Leu | Gly | Thr | Phe | Val | Glu | Asn | His | Asp | Asn | Pro | Arg |      |
| 305 |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |     |      |
| ttc | gct | tct | tac | acc | aac | gac | ata | gcc | ctc | gcc | aag | aac | gtc | gca | gca | 1008 |
| Phe | Ala | Ser | Tyr | Thr | Asn | Asp | Ile | Ala | Leu | Ala | Lys | Asn | Val | Ala | Ala |      |
|     |     | 325 |     |     |     |     | 330 |     |     |     | 335 |     |     |     |     |      |
| ttc | atc | atc | ctc | aac | gac | gga | atc | ccc | atc | atc | tac | gcc | ggc | caa | gaa | 1056 |
| Phe | Ile | Ile | Leu | Asn | Asp | Gly | Ile | Pro | Ile | Ile | Tyr | Ala | Gly | Gln | Glu |      |
|     | 340 |     |     |     | 345 |     |     |     |     |     | 350 |     |     |     |     |      |
| cag | cac | tac | gcc | ggc | gga | aac | gac | ccc | gcg | aac | cgc | gaa | gca | acc | tgg | 1104 |
| Gln | His | Tyr | Ala | Gly | Gly | Asn | Asp | Pro | Ala | Asn | Arg | Glu | Ala | Thr | Trp |      |
|     | 355 |     |     |     | 360 |     |     |     |     |     | 365 |     |     |     |     |      |
| ctc | tcg | ggc | tac | ccg | acc | gac | agc | gag | ctg | tac | aag | tta | att | gcc | tcc | 1152 |
| Leu | Ser | Gly | Tyr | Pro | Thr | Asp | Ser | Glu | Leu | Tyr | Lys | Leu | Ile | Ala | Ser |      |
|     | 370 |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |     |      |
| gcg | aac | gca | atc | cgg | aac | tat | gcc | att | agc | aaa | gat | aca | gga | ttc | gtg | 1200 |
| Ala | Asn | Ala | Ile | Arg | Asn | Tyr | Ala | Ile | Ser | Lys | Asp | Thr | Gly | Phe | Val |      |
| 385 |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |     |      |
| acc | tac | aag | aac | tgg | ccc | atc | tac | aaa | gac | gac | aca | acg | atc | gcc | atg | 1248 |
| Thr | Tyr | Lys | Asn | Trp | Pro | Ile | Tyr | Lys | Asp | Asp | Thr | Thr | Ile | Ala | Met |      |

|   |     |     |     |      |
|---|-----|-----|-----|------|
|   | 405 | 410 | 415 |      |
| cgc aag ggc aca gat ggg tcg cag atc gtg act atc ttg tcc aac aag |     |     |     | 1296 |
| Arg Lys Gly Thr Asp Gly Ser Gln Ile Val Thr Ile Leu Ser Asn Lys |     |     |     |      |
|   | 420 | 425 | 430 |      |
| ggg gct tcg ggt gat tcg tat acc ctc tcc ttg agt ggt gcg ggt tac |     |     |     | 1344 |
| Gly Ala Ser Gly Asp Ser Tyr Thr Leu Ser Leu Ser Gly Ala Gly Tyr |     |     |     |      |
|   | 435 | 440 | 445 |      |
| aca gcc ggc cag caa ttg acg gag gtc att ggc tgc acg acc gtg acg |     |     |     | 1392 |
| Thr Ala Gly Gln Gln Leu Thr Glu Val Ile Gly Cys Thr Thr Val Thr |     |     |     |      |
|   | 450 | 455 | 460 |      |
| ggt ggt tcg gat gga aat gtg cct gtt cct atg gca ggt ggg cta cct |     |     |     | 1440 |
| Val Gly Ser Asp Gly Asn Val Pro Val Pro Met Ala Gly Gly Leu Pro |     |     |     |      |
| 465   | 470 | 475 | 480 |      |
| agg gta ttg tat ccg act gag aag ttg gca ggt agc aag atc tgt agt |     |     |     | 1488 |
| Arg Val Leu Tyr Pro Thr Glu Lys Leu Ala Gly Ser Lys Ile Cys Ser |     |     |     |      |
|   | 485 | 490 | 495 |      |
| agc tcg tga   |     |     |     | 1497 |
| Ser Ser   |     |     |     |      |

<210> 11  
 <211> 498  
 <212> PRT  
 <213> Aspergillus niger

<400> 11  
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 Phe Leu Leu Thr Asp Arg Phe Ala Arg Thr Asp Gly Ser Thr Thr Ala  
 35 40 45  
 Thr Cys Asn Thr Ala Asp Gln Lys Tyr Cys Gly Gly Thr Trp Gln Gly  
 50 55 60  
 Ile Ile Asp Lys Leu Asp Tyr Ile Gln Gly Met Gly Phe Thr Ala Ile  
 65 70 75 80  
 Trp Ile Thr Pro Val Thr Ala Gln Leu Pro Gln Thr Thr Ala Tyr Gly  
 85 90 95  
 Asp Ala Tyr His Gly Tyr Trp Gln Gln Asp Ile Tyr Ser Leu Asn Glu  
 100 105 110  
 Asn Tyr Gly Thr Ala Asp Asp Leu Lys Ala Leu Ser Ser Ala Leu His  
 115 120 125  
 Glu Arg Gly Met Tyr Leu Met Val Asp Val Val Ala Asn His Met Gly  
 130 135 140  
 Tyr Asp Gly Ala Gly Ser Ser Val Asp Tyr Ser Val Phe Lys Pro Phe  
 145 150 155 160  
 Ser Ser Gln Asp Tyr Phe His Pro Phe Cys Phe Ile Gln Asn Tyr Glu  
 165 170 175  
 Asp Gln Thr Gln Val Glu Asp Cys Trp Leu Gly Asp Asn Thr Val Ser  
 180 185 190  
 Leu Pro Asp Leu Asp Thr Thr Lys Asp Val Val Lys Asn Glu Trp Tyr  
 195 200 205  
 Asp Trp Val Gly Ser Leu Val Ser Asn Tyr Ser Ile Asp Gly Leu Arg  
 210 215 220  
 Ile Asp Thr Val Lys His Val Gln Lys Asp Phe Trp Pro Gly Tyr Asn  
 225 230 235 240



Lys Ala Ala Gly Val Tyr Cys Ile Gly Glu Val Leu Asp Gly Asp Pro  
 245 250 255  
 Ala Tyr Thr Cys Pro Tyr Gln Asn Val Met Asp Gly Val Leu Asn Tyr  
 260 265 270  
 Pro Ile Tyr Tyr Pro Leu Leu Asn Ala Phe Lys Ser Thr Ser Gly Ser  
 275 280 285  
 Met Asp Asp Leu Tyr Asn Met Ile Asn Thr Val Lys Ser Asp Cys Pro  
 290 295 300  
 Asp Ser Thr Leu Leu Gly Thr Phe Val Glu Asn His Asp Asn Pro Arg  
 305 310 315 320  
 Phe Ala Ser Tyr Thr Asn Asp Ile Ala Leu Ala Lys Asn Val Ala Ala  
 325 330 335  
 Phe Ile Ile Leu Asn Asp Gly Ile Pro Ile Ile Tyr Ala Gly Gln Glu  
 340 345 350  
 Gln His Tyr Ala Gly Gly Asn Asp Pro Ala Asn Arg Glu Ala Thr Trp  
 355 360 365  
 Leu Ser Gly Tyr Pro Thr Asp Ser Glu Leu Tyr Lys Leu Ile Ala Ser  
 370 375 380  
 Ala Asn Ala Ile Arg Asn Tyr Ala Ile Ser Lys Asp Thr Gly Phe Val  
 385 390 395 400  
 Thr Tyr Lys Asn Trp Pro Ile Tyr Lys Asp Asp Thr Thr Ile Ala Met  
 405 410 415  
 Arg Lys Gly Thr Asp Gly Ser Gln Ile Val Thr Ile Leu Ser Asn Lys  
 420 425 430  
 Gly Ala Ser Gly Asp Ser Tyr Thr Leu Ser Leu Ser Gly Ala Gly Tyr  
 435 440 445  
 Thr Ala Gly Gln Gln Leu Thr Glu Val Ile Gly Cys Thr Thr Val Thr  
 450 455 460  
 Val Gly Ser Asp Gly Asn Val Pro Val Pro Met Ala Gly Gly Leu Pro  
 465 470 475 480  
 Arg Val Leu Tyr Pro Thr Glu Lys Leu Ala Gly Ser Lys Ile Cys Ser  
 485 490 495  
 Ser Ser.

&lt;210&gt; 12

&lt;211&gt; 3697

&lt;212&gt; DNA

<213> *Aspergillus niger*

&lt;400&gt; 12

|             |            |            |            |             |            |     |
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| cctgtggtaa  | gattgatcgt | caggagatta | tctgcaggaa | acatcatggg  | ggggtaacca | 120 |
| aggttggtgc  | tgtataatat | atacatgtaa | gatacatgag | cttcgggtgat | ataatacaga | 180 |
| agtaccatcac | agtaccgcgt | tatgaaaaca | cattaatccg | gaccccttcc  | tataatagac | 240 |
| tagcgtgctt  | ggcattaggg | ttcgaaaaac | aatcgaagag | tataagggga  | tgacagcagt | 300 |
| aacgactcca  | actgtacgcc | tccgggtagt | agaccgagca | gccgagccag  | ctcagcgcct | 360 |
| aaaacgcctt  | atacaattaa | gcagttaaag | aagttagaat | ctacgccttaa | aaagctactt | 420 |
| aaaaatcgat  | ctcgcagtc  | cgattcgcct | atcaaaacca | gtttaaatca  | actgattaaa | 480 |
| ggtgccgaac  | gagctataaa | tgatataaca | atattaaagc | attaattaga  | gcaatatcag | 540 |
| gccgcgcacg  | aaaggcaact | taaaaagcga | aagcgctcta | ctaaacagat  | tacttttgaa | 600 |
| aaaggcacat  | cagtatttaa | agcccgaatc | cttattaagc | gccgaaatca  | ggcagataaa | 660 |
| gccatacagg  | cagatagacc | tctacctatt | aaatcggtt  | ctaggcgccg  | tccatctaaa | 720 |
| tggtctggct  | gtggtgtaca | ggggcataaa | attacgcact | accggaatcg  | atagaactac | 780 |
| tcatttttat  | atagaagtca | gaattcatgg | tgttttgatc | atttttaaatt | tttatatggc | 840 |
| gggtgggtgg  | caactcgctt | gcgcgggcaa | ctcgtttacc | gattacgtta  | gggctgatat | 900 |
| ttacgtaaaa  | atcgtcaagg | gatgcaagac | caaagtagta | aaaccocgga  | gtcaacagca | 960 |

|             |             |             |            |            |             |      |
|-------------|-------------|-------------|------------|------------|-------------|------|
| tccaagccca  | agtccttcac  | ggagaaaccc  | cagcgtccac | atcacgagcg | aaggaccacc  | 1020 |
| tctaggcatc  | ggacgcacca  | tccaattaga  | agcagcaaag | cgaaacagcc | caagaaaaag  | 1080 |
| gtcggcccg   | cgcccttttc  | tgcaacgctg  | atcacgggca | gcgatccaac | caaccaacctc | 1140 |
| cagagtgact  | aggggcgga   | atttaaagg   | attaatttcc | actcaaccac | aaatcacagt  | 1200 |
| cgtccccgg   | attgtcctgc  | agaatgcaat  | ttaaactctt | ctgcgaatcg | cttggattcc  | 1260 |
| ccgccccctg  | ccgtagagct  | taaagtatgt  | cccttgctga | tgcgatgtat | cacaa catat | 1320 |
| aaatactagc  | aaagggatgcc | atgcttgagg  | gatagcaacc | gacaacatca | catca agctc | 1380 |
| tcctctctct  | gaacaataaa  | ccccacagaa  | ggcatttatg | atggctcgct | ggagggtctct | 1440 |
| atttctgtac  | ggccttcagg  | tcgcggcacc  | tgctttggct | gcaacgcctg | cggactggcg  | 1500 |
| atcgcaatcc  | atttatcttc  | ttctcacgga  | tcgatttgca | aggacggatg | ggctcgacgac | 1560 |
| tgcgacttgt  | aatactgcgg  | atcaggtgtg  | ttgttaccta | ctagctttca | gaaagaggaa  | 1620 |
| tgtaaaactga | cttgatatag  | aaatactgtg  | gtggaacatg | gcagggcata | atcga caagg | 1680 |
| taaattgccc  | ctttatcaaa  | aaaaaagaag  | gaaaagcaga | agaaaaataa | aataa aaaga | 1740 |
| actctagtc   | taaccatcac  | atagttggac  | tatatccagg | gaatgggctt | cacagccatc  | 1800 |
| tggatcacc   | ccgttacagc  | ccagctgccc  | cagaccaccg | catatggaga | tgcct accat | 1860 |
| ggctactggc  | agcaggatat  | gtaagtcgat  | ttctttaaat | atctacctgt | catct tttac | 1920 |
| atcaatatga  | actaacttga  | tggttttaga  | tactctctga | acgaaaacta | cggca ctgca | 1980 |
| gatgacttga  | aggcgctctc  | ttcgcccttc  | catgagaggg | ggatgtatct | tatggctcgat | 2040 |
| gtgggtgcta  | accatattgg  | tcgtggtcct  | ttgcaactga | cttcgcggat | atgggtcatt  | 2100 |
| tcagtactga  | caatgagtaa  | tatcagggtc  | atgatggagc | gggtagctca | gtcgattaca  | 2160 |
| gtgtgtttaa  | accgttcagt  | tcccaagact  | acttccaacc | gttctgtttc | attca aaact | 2220 |
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| atctcgatac  | caccaaggat  | gtgggtcaaga | atgaatggta | cgactgggtg | ggatc atttg | 2340 |
| tatcgaacta  | ctccagtaag  | atatttctcc  | ctcattctac | aacttggtcg | atcgatgata  | 2400 |
| cttacgaaat  | cagttgacgg  | cctccgtatc  | gacacagtaa | aacacgtcca | gaaggacttc  | 2460 |
| tggtccgggt  | acaacaaagc  | cgcaggcgctg | tactgtatcg | gcgaggtgct | cgaagggtgat | 2520 |
| ccggcctaca  | cttgtcccta  | ccagaacgtc  | atggacggcg | tactgaacta | tcccatgtat  | 2580 |
| ggttcctcca  | accatgagcc  | ttcttgcaag  | tctcatctcc | taacgaaacg | gctaaaacca  | 2640 |
| gttactatcc  | actcctcaac  | gccttcaagt  | caacctccgg | cagcatggac | gacct ctaca | 2700 |
| acatgatcaa  | caaccgtcaa  | tccgactgtc  | cagactcaac | actcctgggc | acattcgctcg | 2760 |
| agaaccacga  | caaccacagg  | ttcgcttcgt  | aagtcttccc | ttttattttc | cgttcccaat  | 2820 |
| ttccacacag  | aa cccacact | aacaagagca  | aagttacacc | aacgacatag | ccctcgccaa  | 2880 |
| gaacgtcgca  | gcattcatca  | tcctcaacga  | cggaaatccc | atcatctacg | ccggccaaga  | 2940 |
| acagcactac  | gc cggcgga  | acgaccccg   | gaacgcgga  | gcaacctggc | tctcgggcta  | 3000 |
| cccgaccgac  | agcgagctgt  | acaagttaat  | tgctcccgcg | aacgcaatcc | ggaacttatgc | 3060 |
| cattagcaaa  | gatacaggat  | tcgtgacct   | caaggtaagc | acaacctcta | agcat accct | 3120 |
| aatggcctat  | cttcagagta  | tctgacacaa  | gagactaatc | actggcaata | cagaactggc  | 3180 |
| ccatctacaa  | agacgacaca  | acgatcgcca  | tgcgcaagg  | cacagatggg | tcgcagatcg  | 3240 |
| tgactatctt  | gtccaacaag  | ggtgcttcgg  | gtgattcgta | tacctctctc | ttgagtggtg  | 3300 |
| cgggttacac  | agccggccag  | caattgacgg  | aggtcattgg | ctgcacgacc | gtgacgggtg  | 3360 |
| gttcggatgg  | aa atgtgcct | gttcctatgg  | caggtgggct | acctagggta | ttgtatccga  | 3420 |
| ctgagaagtt  | ggcaggtagc  | aagatctgta  | gtagctcgta | aagggtggag | agtatatgat  | 3480 |
| ggtactgcta  | ttcaatctgg  | cattggacag  | tgagtttgag | tttgatgtac | agttggagtc  | 3540 |
| gttactgctg  | tc atccccct | atactcttcg  | attgtttttc | gaacctaat  | gccaagcacg  | 3600 |
| ctagtctatt  | ataggaaagg  | atccggatta  | atgtgttttc | ataacgcggg | actgtatggg  | 3660 |
| acttctgtat  | ta tatcaccg | aagctcatgt  | atcttac    |            |             | 3697 |

&lt;210&gt; 13

&lt;211&gt; 1497

&lt;212&gt; DNA

<213> *Aspergillus niger*

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1) .. (1497)



<400> 13

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| 1 5 10 15   |     |
| cct gct ttg gct gca acg cct gcg gac tgg cga tcg caa tcc att tat | 96  |
| Pro Ala Leu Ala Ala Thr Pro Ala Asp Trp Arg Ser Gln Ser Ile Tyr |     |
| 20 25 30  |     |
| ttc ctt ctc acg gat cga ttt gca agg acg gat ggg tcg acg act gcg | 144 |
| Phe Leu Leu Thr Asp Arg Phe Ala Arg Thr Asp Gly Ser Thr Thr Ala |     |
| 35 40 45  |     |
| act tgt aat act gcg gat cag aaa tac tgt ggt gga aca tgg cag ggc | 192 |
| Thr Cys Asn Thr Ala Asp Gln Lys Tyr Cys Gly Gly Thr Trp Gln Gly |     |
| 50 55 60  |     |
| atc atc gac aag ttg gac tat atc cag gga atg ggc ttc aca gcc atc | 240 |
| Ile Ile Asp Lys Leu Asp Tyr Ile Gln Gly Met Gly Phe Thr Ala Ile |     |
| 65 70 75 80   |     |
| tgg atc acc ccc gtt aca gcc cag ctg ccc cag acc acc gca tat gga | 288 |
| Trp Ile Thr Pro Val Thr Ala Gln Leu Pro Gln Thr Thr Ala Tyr Gly |     |
| 85 90 95  |     |
| gat gcc tac cat ggc tac tgg cag cag gat ata tac tct ctg aac gaa | 336 |
| Asp Ala Tyr His Gly Tyr Trp Gln Gln Asp Ile Tyr Ser Leu Asn Glu |     |
| 100 105 110   |     |
| aac tac ggc act gca gat gac ttg aag gcg ctc tct tcg gcc ctt cat | 384 |
| Asn Tyr Gly Thr Ala Asp Asp Leu Lys Ala Leu Ser Ser Ala Leu His |     |
| 115 120 125   |     |
| gag agg ggg atg tat ctt atg gtc gat gtg gtt gct aac cat atg ggc | 432 |
| Glu Arg Gly Met Tyr Leu Met Val Asp Val Val Ala Asn His Met Gly |     |
| 130 135 140   |     |
| tat gat gga gcg ggt agc tca gtc gat tac agt gtg ttt aaa ccg ttc | 480 |
| Tyr Asp Gly Ala Gly Ser Ser Val Asp Tyr Ser Val Phe Lys Pro Phe |     |
| 145 150 155 160   |     |
| agt tcc caa gac tac ttc cac ccg ttc tgt ttc att caa aac tat gaa | 528 |
| Ser Ser Gln Asp Tyr Phe His Pro Phe Cys Phe Ile Gln Asn Tyr Glu |     |
| 165 170 175   |     |
| gat cag act cag gtt gag gat tgc tgg cta gga gat aac act gtc tcc | 576 |
| Asp Gln Thr Gln Val Glu Asp Cys Trp Leu Gly Asp Asn Thr Val Ser |     |
| 180 185 190   |     |
| ttg cct gat ctc gat acc acc aag gat gtg gtc aag aat gaa tgg tac | 624 |
| Leu Pro Asp Leu Asp Thr Thr Lys Asp Val Val Lys Asn Glu Trp Tyr |     |
| 195 200 205   |     |
| gac tgg gtg gga tca ttg gta tcg aac tac tcc att gac ggc ctc cgt | 672 |
| Asp Trp Val Gly Ser Leu Val Ser Asn Tyr Ser Ile Asp Gly Leu Arg |     |
| 210 215 220   |     |
| atc gac aca gta aaa cac gtc cag aag gac ttc tgg ccc ggg tac aac | 720 |
| Ile Asp Thr Val Lys His Val Gln Lys Asp Phe Trp Pro Gly Tyr Asn |     |
| 225 230 235 240   |     |
| aaa gcc gca ggc gtg tac tgt atc ggc gag gtg ctc gac ggt gat ccg | 768 |
| Lys Ala Ala Gly Val Tyr Cys Ile Gly Glu Val Leu Asp Gly Asp Pro |     |
| 245 250 255   |     |
| gcc tac act tgt ccc tac cag aac gtc atg gac ggc gta ctg aac tat | 816 |
| Ala Tyr Thr Cys Pro Tyr Gln Asn Val Met Asp Gly Val Leu Asn Tyr |     |
| 260 265 270   |     |
| ccc att tac tat cca ctc ctc aac gcc ttc aag tca acc tcc ggc agc | 864 |
| Pro Ile Tyr Tyr Pro Leu Leu Asn Ala Phe Lys Ser Thr Ser Gly Ser |     |
| 275 280 285   |     |
| atg gac gac ctc tac aac atg atc aac acc gtc aaa tcc gac tgt cca | 912 |
| Met Asp Asp Leu Tyr Asn Met Ile Asn Thr Val Lys Ser Asp Cys Pro |     |

|   |     |     |      |
|---|-----|-----|------|
| 290   | 295 | 300 |      |
| gac tca aca ctc ctg ggc aca ttc gtc gag aac cac gac aac cca cgg |     |     | 960  |
| Asp Ser Thr Leu Leu Gly Thr Phe Val Glu Asn His Asp Asn Pro Arg |     |     |      |
| 305   | 310 | 315 | 320  |
| ttc gct tct tac acc aac gac ata gcc ctc gcc aag aac gtc gca gca |     |     | 1008 |
| Phe Ala Ser Tyr Thr Asn Asp Ile Ala Leu Ala Lys Asn Val Ala Ala |     |     |      |
|   | 325 | 330 | 335  |
| ttc atc atc ctc aac gac gga atc ccc atc atc tac gcc ggc caa gaa |     |     | 1056 |
| Phe Ile Ile Leu Asn Asp Gly Ile Pro Ile Ile Tyr Ala Gly Gln Glu |     |     |      |
|   | 340 | 345 | 350  |
| cag cac tac gcc ggc gga aac gac ccc gcg aac cgc gaa gca acc tgg |     |     | 1104 |
| Gln His Tyr Ala Gly Gly Asn Asp Pro Ala Asn Arg Glu Ala Thr Trp |     |     |      |
|   | 355 | 360 | 365  |
| ctc tcg ggc tac ccg acc gac agc gag ctg tac aag tta att gcc tcc |     |     | 1152 |
| Leu Ser Gly Tyr Pro Thr Asp Ser Glu Leu Tyr Lys Leu Ile Ala Ser |     |     |      |
|   | 370 | 375 | 380  |
| gcg aac gca atc cgg aac tat gcc att agc aaa gat aca gga ttc gtg |     |     | 1200 |
| Ala Asn Ala Ile Arg Asn Tyr Ala Ile Ser Lys Asp Thr Gly Phe Val |     |     |      |
| 385   | 390 | 395 | 400  |
| acc tac aag aac tgg ccc atc tac aaa gac gac aca acg atc gcc atg |     |     | 1248 |
| Thr Tyr Lys Asn Trp Pro Ile Tyr Lys Asp Asp Thr Thr Ile Ala Met |     |     |      |
|   | 405 | 410 | 415  |
| cgc aag ggc aca gat ggg tcg cag atc gtg act atc ttg tcc aac aag |     |     | 1296 |
| Arg Lys Gly Thr Asp Gly Ser Gln Ile Val Thr Ile Leu Ser Asn Lys |     |     |      |
|   | 420 | 425 | 430  |
| ggt gct tcg ggt gat tcg tat acc ctc tcc ttg agt ggt gcg ggt tac |     |     | 1344 |
| Gly Ala Ser Gly Asp Ser Tyr Thr Leu Ser Leu Ser Gly Ala Gly Tyr |     |     |      |
|   | 435 | 440 | 445  |
| aca gcc ggc cag caa ttg acg gag gtc att ggc tgc acg acc gtg acg |     |     | 1392 |
| Thr Ala Gly Gln Gln Leu Thr Glu Val Ile Gly Cys Thr Thr Val Thr |     |     |      |
|   | 450 | 455 | 460  |
| gtt ggt tcg gat gga aat gtg cct gtt cct atg gca ggt ggg cta cct |     |     | 1440 |
| Val Gly Ser Asp Gly Asn Val Pro Val Pro Met Ala Gly Gly Leu Pro |     |     |      |
| 465   | 470 | 475 | 480  |
| agg gta ttg tat ccg act gag aag ttg gca ggt agc aag atc tgt agt |     |     | 1488 |
| Arg Val Leu Tyr Pro Thr Glu Lys Leu Ala Gly Ser Lys Ile Cys Ser |     |     |      |
|   | 485 | 490 | 495  |
| agc tcg tga   |     |     | 1497 |
| Ser Ser   |     |     |      |

&lt;210&gt; 14

&lt;211&gt; 498

&lt;212&gt; PRT

&lt;213&gt; Aspergillus niger

&lt;400&gt; 14

|   |    |
|---|----|
| Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala Ala |    |
| 1   | 5  |
| Pro Ala Leu Ala Ala Thr Pro Ala Asp Trp Arg Ser Gln Ser Ile Tyr | 10 |
|   | 15 |
|   | 20 |
| Phe Leu Leu Thr Asp Arg Phe Ala Arg Thr Asp Gly Ser Thr Thr Ala | 25 |
|   | 30 |
|   | 35 |
| Thr Cys Asn Thr Ala Asp Gln Lys Tyr Cys Gly Gly Thr Trp Gln Gly | 40 |
|   | 45 |
|   | 50 |
| Ile Ile Asp Lys Leu Asp Tyr Ile Gln Gly Met Gly Phe Thr Ala Ile | 55 |
|   | 60 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 65  | Trp | Ile | Thr | Pro | Val | Thr | Ala | Gln | Leu | Pro | Gln | Thr | Thr | Ala | Tyr | Gly | 80 |
|     |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     |     | 95  |    |
|     | Asp | Ala | Tyr | His | Gly | Tyr | Trp | Gln | Gln | Asp | Ile | Tyr | Ser | Leu | Asn | Glu |    |
|     |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |    |
|     | Asn | Tyr | Gly | Thr | Ala | Asp | Asp | Leu | Lys | Ala | Leu | Ser | Ser | Ala | Leu | His |    |
|     |     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |    |
|     | Glu | Arg | Gly | Met | Tyr | Leu | Met | Val | Asp | Val | Val | Ala | Asn | His | Met | Gly |    |
|     |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |    |
|     | Tyr | Asp | Gly | Ala | Gly | Ser | Ser | Val | Asp | Tyr | Ser | Val | Phe | Lys | Pro | Phe |    |
| 145 |     |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |    |
|     | Ser | Ser | Gln | Asp | Tyr | Phe | His | Pro | Phe | Cys | Phe | Ile | Gln | Asn | Tyr | Glu |    |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |    |
|     | Asp | Gln | Thr | Gln | Val | Glu | Asp | Cys | Trp | Leu | Gly | Asp | Asn | Thr | Val | Ser |    |
|     |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |    |
|     | Leu | Pro | Asp | Leu | Asp | Thr | Thr | Lys | Asp | Val | Val | Lys | Asn | Glu | Trp | Tyr |    |
|     |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |    |
|     | Asp | Trp | Val | Gly | Ser | Leu | Val | Ser | Asn | Tyr | Ser | Ile | Asp | Gly | Leu | Arg |    |
|     |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |    |
|     | Ile | Asp | Thr | Val | Lys | His | Val | Gln | Lys | Asp | Phe | Trp | Pro | Gly | Tyr | Asn |    |
| 225 |     |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |    |
|     | Lys | Ala | Ala | Gly | Val | Tyr | Cys | Ile | Gly | Glu | Val | Leu | Asp | Gly | Asp | Pro |    |
|     |     |     |     | 245 |     |     |     |     |     | 250 |     |     |     |     | 255 |     |    |
|     | Ala | Tyr | Thr | Cys | Pro | Tyr | Gln | Asn | Val | Met | Asp | Gly | Val | Leu | Asn | Tyr |    |
|     |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |    |
|     | Pro | Ile | Tyr | Tyr | Pro | Leu | Leu | Asn | Ala | Phe | Lys | Ser | Thr | Ser | Gly | Ser |    |
|     |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |    |
|     | Met | Asp | Asp | Leu | Tyr | Asn | Met | Ile | Asn | Thr | Val | Lys | Ser | Asp | Cys | Pro |    |
|     |     | 290 |     |     |     | 295 |     |     |     |     |     | 300 |     |     |     |     |    |
|     | Asp | Ser | Thr | Leu | Leu | Gly | Thr | Phe | Val | Glu | Asn | His | Asp | Asn | Pro | Arg |    |
| 305 |     |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |    |
|     | Phe | Ala | Ser | Tyr | Thr | Asn | Asp | Ile | Ala | Leu | Ala | Lys | Asn | Val | Ala | Ala |    |
|     |     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |     | 335 |     |    |
|     | Phe | Ile | Ile | Leu | Asn | Asp | Gly | Ile | Pro | Ile | Ile | Tyr | Ala | Gly | Gln | Glu |    |
|     |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |    |
|     | Gln | His | Tyr | Ala | Gly | Gly | Asn | Asp | Pro | Ala | Asn | Arg | Glu | Ala | Thr | Trp |    |
|     |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |    |
|     | Leu | Ser | Gly | Tyr | Pro | Thr | Asp | Ser | Glu | Leu | Tyr | Lys | Leu | Ile | Ala | Ser |    |
|     |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |    |
|     | Ala | Asn | Ala | Ile | Arg | Asn | Tyr | Ala | Ile | Ser | Lys | Asp | Thr | Gly | Phe | Val |    |
| 385 |     |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |    |
|     | Thr | Tyr | Lys | Asn | Trp | Pro | Ile | Tyr | Lys | Asp | Asp | Thr | Thr | Ile | Ala | Met |    |
|     |     |     |     | 405 |     |     |     |     |     | 410 |     |     |     |     | 415 |     |    |
|     | Arg | Lys | Gly | Thr | Asp | Gly | Ser | Gln | Ile | Val | Thr | Ile | Leu | Ser | Asn | Lys |    |
|     |     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |    |
|     | Gly | Ala | Ser | Gly | Asp | Ser | Tyr | Thr | Leu | Ser | Leu | Ser | Gly | Ala | Gly | Tyr |    |
|     |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |    |
|     | Thr | Ala | Gly | Gln | Gln | Leu | Thr | Glu | Val | Ile | Gly | Cys | Thr | Thr | Val | Thr |    |
|     |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |    |
|     | Val | Gly | Ser | Asp | Gly | Asn | Val | Pro | Val | Pro | Met | Ala | Gly | Gly | Leu | Pro |    |
| 465 |     |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |    |
|     | Arg | Val | Leu | Tyr | Pro | Thr | Glu | Lys | Leu | Ala | Gly | Ser | Lys | Ile | Cys | Ser |    |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     |     | 495 |     |    |
|     | Ser | Ser |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |

&lt;211&gt; 3570

&lt;212&gt; DNA

<213> *Aspergillus niger*

&lt;400&gt; 15

|             |             |             |             |              |             |      |
|-------------|-------------|-------------|-------------|--------------|-------------|------|
| ggaaccagta  | cggcagctga  | tagtatccga  | aagctgcaaa  | ttgcttc atc  | gaggctggca  | 60   |
| ttcgatagaa  | gaaagaatta  | tagacaacta  | gtcttgcaat  | atgacaa ttc  | tctttgatta  | 120  |
| ataaatgaaa  | gcacgcatgt  | atcagcctaa  | tagccgagtg  | gcgggca tct  | ctggcggcct  | 180  |
| cccagagcagc | gtggaatgcg  | tccaagatcc  | cgtccgcggg  | tcgtcct tct  | gtcggaatga  | 240  |
| tgactggagc  | agcagacgat  | gtcctgagct  | gaatgcatgt  | gatattc aca  | ttccagggag  | 300  |
| aattgtcggc  | tatttagaac  | cctctcggct  | taaaagccct  | attagac tat  | gggtgcgctc  | 360  |
| aagccactag  | ccaggatata  | ccgctgaacg  | ctccatcacc  | ttgcagc tga  | agtgcacat   | 420  |
| gggacgggct  | ttaacttttc  | gtagatataa  | gtttaattta  | tctctc cac   | acccataggg  | 480  |
| tcgtatgggtg | tcaaccgggtg | tagtctgcag  | gatttcatct  | cgttcct cca  | agcagggcgc  | 540  |
| cctaaccgggc | agcctgcagc  | ttaccctgtt  | aaccccggt   | caccacc ccc  | cgagcaatcc  | 600  |
| gtcgcgtcct  | ccacgagtca  | taacaagggt  | cgggcggtgt  | ttcttac ccc  | cactatcagg  | 660  |
| cgtattcagt  | taacagtcag  | tagtcccgtg  | tcggagattt  | gttggtc tgc  | aacaattaaa  | 720  |
| ggggaccagg  | gttaaatcct  | ggcccccgaa  | ctgatcggag  | tttcggc caa  | tgagagatgt  | 780  |
| tgtatacccc  | cgttcctggc  | agatggatta  | attgccggct  | ccatttg gca  | tccatcaagc  | 840  |
| atcatacggg  | attagaaggg  | tagttcgtgg  | gttgatctgc  | cgtgcaa ggt  | gctcaaggct  | 900  |
| ctggagtcac  | gctgaacgca  | aatttttaag  | aatcgtcgtc  | agggaca gcg  | ttctctggat  | 960  |
| agtcaagctg  | tgcttgggac  | gctgttctgt  | cgttttgtca  | aaacata att  | cgcagcgatg  | 1020 |
| agattatcga  | cttcgagctc  | cttcctttcc  | gtgtctctgc  | tggggaa gct  | ggccctcggg  | 1080 |
| ctgtcggctg  | cagaatggcg  | cactcagtcg  | atttacttcc  | tattgac gga  | tcggttcggg  | 1140 |
| aggacggaca  | attcgacgac  | agctacatgc  | gatacgggtg  | accaagt acg  | ttgggtattgc | 1200 |
| aggacttcca  | tcattcatct  | actgacttga  | atagatctat  | tgtgggtg gca | gttggcaagg  | 1260 |
| aatcatcaac  | catgtttgtg  | atcacttcat  | actatccgct  | gtgcgcgtgt   | ctgactttat  | 1320 |
| ttgctgcagc  | tggattatat  | ccagggcatg  | ggattcaagg  | ccatctg gat  | ctcgcctatc  | 1380 |
| actgaacagc  | tgccccagga  | tactgctgat  | gggtgaagctt | accatgggata  | ttggcagcag  | 1440 |
| aagatgtatg  | cgtccctcct  | tcccatatcg  | taggcttact  | ctcaggc ggc  | gactgacttg  | 1500 |
| acagatacga  | cgtgaactcc  | aacttcggca  | ctgcagatga  | cctcaagtcc   | ctctcagatg  | 1560 |
| cgttctcatg  | ccgcggaatg  | tacctcatgg  | tggacgtcgt  | ccctaaccac   | atggtaagtg  | 1620 |
| ctgcttcagc  | atccttatca  | gtgaactcca  | agtgcacacg  | ctaactgtac   | cagggctacg  | 1680 |
| ccggcaacgg  | caacgatgta  | gactacagcg  | tcttcgaccc  | cttcgat tcc  | tctcctact   | 1740 |
| tccacccata  | ctgcctgata  | acagattggg  | acaacttgac  | catgggtcaa   | gattggtggg  | 1800 |
| agggtgacac  | catcgtatct  | ctgcacagac  | taaacaccac  | cgaaact gcc  | gtgagaacaa  | 1860 |
| tctgggtatga | ctgggttagcc | gacctgggtat | ccaattatc   | aggtgcggaat  | tccaacccaa  | 1920 |
| tttaaaataa  | ccatatacta  | agtgaataca  | ccagtgcagc  | gactccgcat   | cgacagtgtc  | 1980 |
| ctcgaagtcg  | aaccagactt  | cttcccgggc  | taccaggaag  | cagcaggtgt   | ctactgcgtc  | 2040 |
| ggcgaagtgc  | acaacggcaa  | ccctgcctc   | gactgcccat  | accagaagg    | cctggacggc  | 2100 |
| gtcctcaact  | atccgatgta  | catcccccta  | tacattgttc  | attagat ctt  | cgttaactcc  | 2160 |
| aaccagctac  | tggcaactcc  | tctacgcctt  | cgaatcctcc  | agcggcagca   | tcagcaacct  | 2220 |
| ctacaacatg  | atcaaatccg  | tcgcaagcga  | ctgctccgat  | ccgacactac   | tcggcaactt  | 2280 |
| catcgaaaac  | cacgacaatc  | cccggttctc  | ctcgtatgtc  | ccaccccctc   | ccctccctac  | 2340 |
| aatcacactc  | actaatacat  | ctaacagcta  | cacctccgac  | tactcgcaag   | ccaaaaacgt  | 2400 |
| cctcagctac  | atcttctctc  | ccgacggcat  | ccccatcgtc  | tacgcccggc   | aagaacagca  | 2460 |
| ctactccggc  | ggcaagggtg  | cctacaaccg  | cgaagcgacc  | tggcttccag   | gctacgacac  | 2520 |
| ctccgcagag  | ctgtacacct  | ggatagccac  | cacgaacgcg  | atccgcaaac   | tagccatctc  | 2580 |
| agctgactcg  | gcctacatta  | cctacgcggg  | tcgtccttcc  | ctcccaacct   | ttacccccca  | 2640 |
| ccctacaaac  | atcccacata  | ctaacaacat  | ttcaataatg  | aaatagaatg   | atgcattcta  | 2700 |
| cactgacagc  | aacaccatcg  | caatgcgcaa  | aggcacctca  | gggagccaag   | tcatacccg   | 2760 |
| cctctccaac  | aaaggctcct  | caggaagcag  | ctacacctg   | accctcagcg   | gaagcggcta  | 2820 |
| cacatccggc  | acgaagctga  | tcgaagcgta  | cacatgcaca  | tccgtgaccg   | tggactcgag  | 2880 |
| cggcgatatt  | cccggtgccga | tggcgctcggg | attaccgaga  | gttcttctgc   | ccgcgtccgt  | 2940 |
| cgtcgatagc  | tcttcgctct  | gtggcggggag | cgggaagatta | tacgtcggag   | aatccggagt  | 3000 |
| ggtcgggttac | tgtgacgttg  | ccgggtgggga | ccactttcga  | gtataagttt   | attaagggtg  | 3060 |
| agtccgatgg  | gactgttact  | tgggaaagtg  | attcgaatcg  | ggagtat acg  | gtgccggagt  | 3120 |

|             |            |            |            |            |            |      |
|-------------|------------|------------|------------|------------|------------|------|
| gtgggagtg   | ggagacggtg | gttgatactt | ggaggtagat | gatctgagat | ttctaagtgt | 3180 |
| gatgaggggtg | gttttggtgt | atgtagtttg | gcctttggta | gtgttgggtt | gggttgggtt | 3240 |
| aataattatg  | ttattgtttt | tgggtgcttg | gaccatggat | ttgaagtga  | aatttgtagg | 3300 |
| ggctacggaa  | gtgtattgtg | gacatgtgag | taaattcatc | tgggtatgta | caaagtgggt | 3360 |
| tagccagtgg  | gcttgaagaa | aagtctcctg | ggctctctgg | ttgagtaccc | atgttaagat | 3420 |
| caagcataaa  | aacatgaaat | attgggaaaa | caaagggtat | ttaacaactc | gtgagcatta | 3480 |
| gctcctgggt  | agaatgcaat | cataacagaa | agtacagcca | gcgctgtgtc | ataaagaagt | 3540 |
| ccagttggga  | aacgaaagac | tagaatcaaa |            |            |            | 3570 |

&lt;210&gt; 16

&lt;211&gt; 1518

&lt;212&gt; DNA

<213> *Aspergillus niger*

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)..(1518)

&lt;400&gt; 16

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| atg | aga | tta | tcg | act | tcg | agt | ctc | ttc | ctt | tcc | gtg | tct | ctg | ctg | ggg | 48  |
| Met | Arg | Leu | Ser | Thr | Ser | Ser | Leu | Phe | Leu | Ser | Val | Ser | Leu | Leu | Gly |     |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |     |
| aag | ctg | gcc | ctc | ggg | ctg | tcg | gct | gca | gaa | tgg | cgc | act | cag | tcg | att | 96  |
| Lys | Leu | Ala | Leu | Gly | Leu | Ser | Ala | Ala | Glu | Trp | Arg | Thr | Gln | Ser | Ile |     |
|     |     |     | 20  |     |     |     | 25  |     |     |     |     |     | 30  |     |     |     |
| tac | ttc | cta | ttg | acg | gat | cgg | ttc | ggg | agg | acg | gac | aat | tcg | acg | aca | 144 |
| Tyr | Phe | Leu | Leu | Thr | Asp | Arg | Phe | Gly | Arg | Thr | Asp | Asn | Ser | Thr | Thr |     |
|     |     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| gct | aca | tgc | gat | acg | ggg | gac | caa | atc | tat | tgt | ggg | ggc | agt | tgg | caa | 192 |
| Ala | Thr | Cys | Asp | Thr | Gly | Asp | Gln | Ile | Tyr | Cys | Gly | Gly | Ser | Trp | Gln |     |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |
| gga | atc | atc | aac | cat | ctg | gat | tat | atc | cag | ggc | atg | gga | ttc | acg | gcc | 240 |
| Gly | Ile | Ile | Asn | His | Leu | Asp | Tyr | Ile | Gln | Gly | Met | Gly | Phe | Thr | Ala |     |
|     | 65  |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |     |     |
| atc | tgg | atc | tcg | cct | atc | act | gaa | cag | ctg | ccc | cag | gat | act | gct | gat | 288 |
| Ile | Trp | Ile | Ser | Pro | Ile | Thr | Glu | Gln | Leu | Pro | Gln | Asp | Thr | Ala | Asp |     |
|     |     |     | 85  |     |     |     |     |     | 90  |     |     |     |     | 95  |     |     |
| ggg | gaa | gct | tac | cat | gga | tat | tgg | cag | cag | aag | ata | tac | gac | gtg | aac | 336 |
| Gly | Glu | Ala | Tyr | His | Gly | Tyr | Trp | Gln | Gln | Lys | Ile | Tyr | Asp | Val | Asn |     |
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| tcc | aac | ttc | ggc | act | gca | gat | gac | ctc | aag | tcc | ctc | tca | gat | gcg | ctt | 384 |
| Ser | Asn | Phe | Gly | Thr | Ala | Asp | Asp | Leu | Lys | Ser | Leu | Ser | Asp | Ala | Leu |     |
|     |     |     | 115 |     |     |     | 120 |     |     |     |     |     | 125 |     |     |     |
| cat | gcc | cgc | gga | atg | tac | ctc | atg | gtg | gac | gtc | gtc | cct | aac | cac | atg | 432 |
| His | Ala | Arg | Gly | Met | Tyr | Leu | Met | Val | Asp | Val | Val | Pro | Asn | His | Met |     |
|     |     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| ggc | tac | gcc | ggc | aac | ggc | aac | gat | gta | gac | tac | agc | gtc | ttc | gac | ccc | 480 |
| Gly | Tyr | Ala | Gly | Asn | Gly | Asn | Asp | Val | Asp | Tyr | Ser | Val | Phe | Asp | Pro |     |
|     |     |     | 145 |     |     | 150 |     |     |     | 155 |     |     |     | 160 |     |     |
| ttc | gat | tcc | tcc | tcc | tac | ttc | cac | cca | tac | tgc | ctg | atc | aca | gat | tgg | 528 |
| Phe | Asp | Ser | Ser | Ser | Tyr | Phe | His | Pro | Tyr | Cys | Leu | Ile | Thr | Asp | Trp |     |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |     |
| gac | aac | ttg | acc | atg | gtc | caa | gat | tgt | tgg | gag | ggg | gac | acc | atc | gta | 576 |
| Asp | Asn | Leu | Thr | Met | Val | Gln | Asp | Cys | Trp | Glu | Gly | Asp | Thr | Ile | Val |     |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |     |
| tct | ctg | cca | gac | cta | aac | acc | acc | gaa | act | gcc | gtg | aga | aca | atc | tgg | 624 |



| Ser | Leu | Pro | Asp | Leu | Asn | Thr | Glu | Thr | Ala | Val | Arg | Thr | Ile   | Trp |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|------|
|     |     | 195 |     |     |     |     | 200 |     |     |     | 205 |     |       |     |     |      |
| tat | gac | tgg | gta | gcc | gac | ctg | gta | tcc | aat | tat | tca | gtc | gac   | gga | ctc | 672  |
| Tyr | Asp | Trp | Val | Ala | Asp | Leu | Val | Ser | Asn | Tyr | Ser | Val | Asp   | Gly | Leu |      |
|     |     | 210 |     |     |     | 215 |     |     |     |     | 220 |     |       |     |     |      |
| cgc | atc | gac | agt | gtc | ctc | gaa | gtc | gaa | cca | gac | ttc | ttc | ccg   | ggc | tac | 720  |
| Arg | Ile | Asp | Ser | Val | Leu | Glu | Val | Glu | Pro | Asp | Phe | Phe | Pro   | Gly | Tyr |      |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |       |     | 240 |      |
| cag | gaa | gca | gca | ggc | gtc | tac | tgc | gtc | ggc | gaa | gtc | gac | aac   | ggc | aac | 768  |
| Gln | Glu | Ala | Ala | Gly | Val | Tyr | Cys | Val | Gly | Glu | Val | Asp | Asn   | Gly | Asn |      |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |       | 255 |     |      |
| cct | gcc | ctc | gac | tgc | cca | tac | cag | aag | gtc | ctg | gac | ggc | gtc   | ctc | aac | 816  |
| Pro | Ala | Leu | Asp | Cys | Pro | Tyr | Gln | Lys | Val | Leu | Asp | Gly | Val   | Leu | Asn |      |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270   |     |     |      |
| tat | ccg | atc | tac | tgg | caa | ctc | ctc | tac | gcc | ttc | gaa | tcc | tcc   | agc | ggc | 864  |
| Tyr | Pro | Ile | Tyr | Trp | Gln | Leu | Leu | Tyr | Ala | Phe | Glu | Ser | Ser   | Ser | Gly |      |
|     |     | 275 |     |     |     | 280 |     |     |     |     |     | 285 |       |     |     |      |
| agc | atc | agc | aac | ctc | tac | aac | atg | atc | aaa | tcc | gtc | gca | agc   | gac | tgc | 912  |
| Ser | Ile | Ser | Asn | Leu | Tyr | Asn | Met | Ile | Lys | Ser | Val | Ala | Ser   | Asp | Cys |      |
|     |     | 290 |     |     |     | 295 |     |     |     |     | 300 |     |       |     |     |      |
| tcc | gat | ccg | aca | cta | ctc | ggc | aac | ttc | atc | gaa | aac | cac | gac   | aat | ccc | 960  |
| Ser | Asp | Pro | Thr | Leu | Leu | Gly | Asn | Phe | Ile | Glu | Asn | His | Asp   | Asn | Pro |      |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |       |     | 320 |      |
| cgt | ttc | gcc | tcc | tac | acc | tcc | gac | tac | tgc | caa | gcc | aaa | aac   | gtc | ctc | 1008 |
| Arg | Phe | Ala | Ser | Tyr | Thr | Ser | Asp | Tyr | Ser | Gln | Ala | Lys | Asn   | Val | Leu |      |
|     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |       | 335 |     |      |
| agc | tac | atc | ttc | ctc | tcc | gac | ggc | atc | ccc | atc | gtc | tac | gcc   | ggc | gaa | 1056 |
| Ser | Tyr | Ile | Phe | Leu | Ser | Asp | Gly | Ile | Pro | Ile | Val | Tyr | Ala   | Gly | Glu |      |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350   |     |     |      |
| gaa | cag | cac | tac | tcc | ggc | ggc | aag | gtg | ccc | tac | aac | cgc | gaa   | gcg | acc | 1104 |
| Glu | Gln | His | Tyr | Ser | Gly | Gly | Lys | Val | Pro | Tyr | Asn | Arg | Glu   | Ala | Thr |      |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |       |     |     |      |
| tgg | ctt | tca | ggc | tac | gac | acc | tcc | gca | gag | ctg | tac | acc | tgg   | ata | gcc | 1152 |
| Trp | Leu | Ser | Gly | Tyr | Asp | Thr | Ser | Ala | Glu | Leu | Tyr | Thr | Trp   | Ile | Ala |      |
|     |     | 370 |     |     |     | 375 |     |     |     |     |     | 380 |       |     |     |      |
| acc | acg | aac | gcg | atc | cgc | aaa | cta | gcc | atc | tca | gct | gac | tgc   | gcc | tac | 1200 |
| Thr | Thr | Asn | Ala | Ile | Arg | Lys | Leu | Ala | Ile | Ser | Ala | Asp | Ser   | Ala | Tyr |      |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |       |     | 400 |      |
| att | acc | tac | gcg | aat | gat | gca | ttc | tac | act | gac | agc | aac | acc</ |     |     |      |

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500 505

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Tyr Phe Leu Leu Thr Asp Arg Phe Gly Arg Thr Asp Asn Ser Thr Thr  
35 40 45  
Ala Thr Cys Asp Thr Gly Asp Gln Ile Tyr Cys Gly Gly Ser Trp Gln  
50 55 60  
Gly Ile Ile Asn His Leu Asp Tyr Ile Gln Gly Met Gly Phe Thr Ala  
65 70 75 80  
Ile Trp Ile Ser Pro Ile Thr Glu Gln Leu Pro Gln Asp Thr Ala Asp  
85 90 95  
Gly Glu Ala Tyr His Gly Tyr Trp Gln Gln Lys Ile Tyr Asp Val Asn  
100 105 110  
Ser Asn Phe Gly Thr Ala Asp Asp Leu Lys Ser Leu Ser Asp Ala Leu  
115 120 125  
His Ala Arg Gly Met Tyr Leu Met Val Asp Val Val Pro Asn His Met  
130 135 140  
Gly Tyr Ala Gly Asn Gly Asn Asp Val Asp Tyr Ser Val Phe Asp Pro  
145 150 155 160  
Phe Asp Ser Ser Ser Tyr Phe His Pro Tyr Cys Leu Ile Thr Asp Trp  
165 170 175  
Asp Asn Leu Thr Met Val Gln Asp Cys Trp Glu Gly Asp Thr Ile Val  
180 185 190  
Ser Leu Pro Asp Leu Asn Thr Thr Glu Thr Ala Val Arg Thr Ile Trp  
195 200 205  
Tyr Asp Trp Val Ala Asp Leu Val Ser Asn Tyr Ser Val Asp Gly Leu  
210 215 220  
Arg Ile Asp Ser Val Leu Glu Val Glu Pro Asp Phe Phe Pro Gly Tyr  
225 230 235 240  
Gln Glu Ala Ala Gly Val Tyr Cys Val Gly Glu Val Asp Asn Gly Asn  
245 250 255  
Pro Ala Leu Asp Cys Pro Tyr Gln Lys Val Leu Asp Gly Val Leu Asn  
260 265 270  
Tyr Pro Ile Tyr Trp Gln Leu Leu Tyr Ala Phe Glu Ser Ser Ser Gly  
275 280 285  
Ser Ile Ser Asn Leu Tyr Asn Met Ile Lys Ser Val Ala Ser Asp Cys  
290 295 300  
Ser Asp Pro Thr Leu Leu Gly Asn Phe Ile Glu Asn His Asp Asn Pro  
305 310 315 320  
Arg Phe Ala Ser Tyr Thr Ser Asp Tyr Ser Gln Ala Lys Asn Val Leu  
325 330 335  
Ser Tyr Ile Phe Leu Ser Asp Gly Ile Pro Ile Val Tyr Ala Gly Glu  
340 345 350  
Glu Gln His Tyr Ser Gly Gly Lys Val Pro Tyr Asn Arg Glu Ala Thr  
355 360 365  
Trp Leu Ser Gly Tyr Asp Thr Ser Ala Glu Leu Tyr Thr Trp Ile Ala

370 375 380  
Thr Thr Asn Ala Ile Arg Lys Leu Ala Ile Ser Ala Asp Ser Ala Tyr  
385 390 395 400  
  
Ile Thr Tyr Ala Asn Asp Ala Phe Tyr Thr Asp Ser Asn Thr Ile Ala  
405 410 415  
Met Arg Lys Gly Thr Ser Gly Ser Gln Val Ile Thr Val Leu Ser Asn  
420 425 430  
Lys Gly Ser Ser Gly Ser Ser Tyr Thr Leu Thr Leu Ser Gly Ser Gly  
435 440 445  
Tyr Thr Ser Gly Thr Lys Leu Ile Glu Ala Tyr Thr Cys Thr Ser Val  
450 455 460  
Thr Val Asp Ser Ser Gly Asp Ile Pro Val Pro Met Ala Ser Gly Leu  
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ggtcctgctt gcccacatata gcttccgacc accggatttg gaccaatcaa cgcaggaaga 180  
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gatgaagagc tcgacgagac cgtgagtatc aaaagttgga gatatagtta ccgattgttg 420  
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&lt;211&gt; 1977

&lt;212&gt; DNA

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&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)..(1977)

&lt;400&gt; 19

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Glu Leu Asp Glu Thr Ser Phe Lys Ser Val Lys Asp Ala Val Leu Phe
20 25 30
gct ata gat att agc agt tgc atg ctc acg cct cgt cca tgc cct gat 144
Ala Ile Asp Ile Ser Ser Ser Met Leu Thr Pro Arg Pro Ser Pro Asp
35 40 45
cct aag aaa cat gga gac gaa tca ccc gcg tct gca gct ttg aag tgt 192
Pro Lys Lys His Gly Asp Glu Ser Pro Ala Ser Ala Ala Leu Lys Cys
50 55 60
gca tac cat ctg atg caa caa cgc atc atc tcc aac cct cat gac atg 240
Ala Tyr His Leu Met Gln Gln Arg Ile Ile Ser Asn Pro His Asp Met
65 70 75 80
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Ile Gly Val Leu Leu Tyr Gly Thr Gln Ser Ser Lys Phe Tyr Asp Glu
85 90 95
aat gag gat gac cgt gga gat ctc tca tat cct cac tgt tat ctg tac 336
Asn Glu Asp Asp Arg Gly Asp Leu Ser Tyr Pro His Cys Tyr Leu Tyr
100 105 110
acg gat ctt gat gtt cca tca gcc cag gaa gtc aag caa ctg cgg tcc 384
Thr Asp Leu Asp Val Pro Ser Ala Gln Glu Val Lys Gln Leu Arg Ser
115 120 125

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| 130 135 140   |      |
| cca tca aag gag cca gcc tcc atg gcc aac atg ctt ttc tgc gcc aac | 480  |
| Pro Ser Lys Glu Pro Ala Ser Met Ala Asn Met Leu Phe Cys Ala Asn |      |
| 145 150 155 160   |      |
| caa atc ttt acc tca aaa gct cca aac ttt gct tct cga cgc ctg ttt | 528  |
| Gln Ile Phe Thr Ser Lys Ala Pro Asn Phe Ala Ser Arg Arg Leu Phe |      |
| 165 170 175   |      |
| gtc gtg acc gac aac gat aat ccc cac gca gac aac aaa gga atg cgg | 576  |
| Val Val Thr Asp Asn Asp Asn Pro His Ala Asp Asn Lys Gly Met Arg |      |
| 180 185 190   |      |
| tct gct gca aca gtt cgt gcg agg gac ttg tac gat ctt ggt gtc aat | 624  |
| Ser Ala Ala Thr Val Arg Ala Arg Asp Leu Tyr Asp Leu Gly Val Asn |      |
| 195 200 205   |      |
| atc gag ttg ttt ccc ata tct caa cca gac cac gaa ttc gac acc tct | 672  |
| Ile Glu Leu Phe Pro Ile Ser Gln Pro Asp His Glu Phe Asp Thr Ser |      |
| 210 215 220   |      |
| aaa ttc tac gac gac att atc tac aaa aca tcg ccc agt gat gga gat | 720  |
| Lys Phe Tyr Asp Asp Ile Ile Tyr Lys Thr Ser Pro Ser Asp Gly Asp |      |
| 225 230 235 240   |      |
| gcc cct gca tac cta cag ccg gat acc aac aca tca aca gct aaa ggc | 768  |
| Ala Pro Ala Tyr Leu Gln Pro Asp Thr Asn Thr Ser Thr Ala Lys Gly |      |
| 245 250 255   |      |
| gat gga ctt tca ttg ctc aat tct ctg ttg tcg agc atc aac tca cga | 816  |
| Asp Gly Leu Ser Leu Leu Asn Ser Leu Leu Ser Ser Ile Asn Ser Arg |      |
| 260 265 270   |      |
| tct gtc ccc cgc cga tcg ctg ttc tca aat gtg cca ctt gag atc gga | 864  |
| Ser Val Pro Arg Arg Ser Leu Phe Ser Asn Val Pro Leu Glu Ile Gly |      |
| 275 280 285   |      |
| cct aat ttc aaa ata tcc gtc aat gga tat ttg ctt ctc aag aaa caa | 912  |
| Pro Asn Phe Lys Ile Ser Val Asn Gly Tyr Leu Leu Leu Lys Lys Gln |      |
| 290 295 300   |      |
| gag cct gca agg agt tgc ttc gtc tgg caa gga ggc gag act gct cag | 960  |
| Glu Pro Ala Arg Ser Cys Phe Val Trp Gln Gly Gly Glu Thr Ala Gln |      |
| 305 310 315 320   |      |
| att gcc aaa gga gtc aca act cta atg tct gat gac aca ggg cag gag | 1008 |
| Ile Ala Lys Gly Val Thr Thr Leu Met Ser Asp Asp Thr Gly Gln Glu |      |
| 325 330 335   |      |
| att gag aag tct gac att cgc aag gca tac aag ttt ggt ggc gag cag | 1056 |
| Ile Glu Lys Ser Asp Ile Arg Lys Ala Tyr Lys Phe Gly Gly Glu Gln |      |
| 340 345 350   |      |
| gta tca ttc acc atc gaa gaa caa cag gcg cta aga agc ttc ggt gac | 1104 |
| Val Ser Phe Thr Ile Glu Glu Gln Gln Ala Leu Arg Ser Phe Gly Asp |      |
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| ccg gtg atc cgt att att ggg ttc aag cca ctg tca gcc ctc ccg ttc | 1152 |
| Pro Val Ile Arg Ile Ile Gly Phe Lys Pro Leu Ser Ala Leu Pro Phe |      |
| 370 375 380   |      |
| tgg gcc aat gtc aag cac ccc tcg ttt att tat ccc tct gaa gag gac | 1200 |
| Trp Ala Asn Val Lys His Pro Ser Phe Ile Tyr Pro Ser Glu Glu Asp |      |
| 385 390 395 400   |      |
| tac gtc ggt tca aca aga gtc ttt tct gca ctg cat cag aaa ctc ctc | 1248 |
| Tyr Val Gly Ser Thr Arg Val Phe Ser Ala Leu His Gln Lys Leu Leu |      |
| 405 410 415   |      |
| gaa tcg gag aaa ctg gct ttg gtc tgg ttc atc ccc cgc aga aat gcc | 1296 |
| Glu Ser Glu Lys Leu Ala Leu Val Trp Phe Ile Pro Arg Arg Asn Ala |      |
| 420 425 430   |      |

|   |      |
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| tca cca gtc tta gct gct atg att gca ggt gct gag aag atc gac gag | 1344 |
| Ser Pro Val Leu Ala Ala Met Ile Ala Gly Ala Glu Lys Ile Asp Glu |      |
| 435 440 445   |      |
| aat ggc gtg cag aaa att cca cct ggg atg tgg att atc cct ctt cct | 1392 |
| Asn Gly Val Gln Lys Ile Pro Pro Gly Met Trp Ile Ile Pro Leu Pro |      |
| 450 455 460   |      |
| ttc gca gat gat gtg cgc caa aat cca gag agc acc gtc cac cgg gca | 1440 |
| Phe Ala Asp Asp Val Arg Gln Asn Pro Glu Ser Thr Val His Arg Ala |      |
| 465 470 475 480   |      |
| gga gat gcg ctg aac gac gcc atg cga gat gtt gtt cgc cag ttg cag | 1488 |
| Gly Asp Ala Leu Asn Asp Ala Met Arg Asp Val Val Arg Gln Leu Gln |      |
| 485 490 495   |      |
| ctc ccc aag gct gtg tac gat cct tca aaa tat ccg aat cct tcg ctt | 1536 |
| Leu Pro Lys Ala Val Tyr Asp Pro Ser Lys Tyr Pro Asn Pro Ser Leu |      |
| 500 505 510   |      |
| caa tgg cat tat cgt atc tta cag gct atc gcc ttg gat gaa gat ttc | 1584 |
| Gln Trp His Tyr Arg Ile Leu Gln Ala Ile Ala Leu Asp Glu Asp Phe |      |
| 515 520 525   |      |
| cca gaa tca cca gat gac aag acc gtg cct aag tac cga cag gtt cac | 1632 |
| Pro Glu Ser Pro Asp Asp Lys Thr Val Pro Lys Tyr Arg Gln Val His |      |
| 530 535 540   |      |
| aag gtt ggc tgc ttc cat gat ccc aga aat gcc cga aca tgg gcc gag | 1680 |
| Lys Val Gly Cys Phe His Asp Pro Arg Asn Ala Arg Thr Trp Ala Glu |      |
| 545 550 555 560   |      |
| gaa ctg aaa ttg caa gcc tcc gag atg ttt ggt ggg tca gta gcc gcc | 1728 |
| Glu Leu Lys Leu Gln Ala Ser Glu Met Phe Gly Gly Ser Val Ala Ala |      |
| 565 570 575   |      |
| acc tct acg ctg gta aag cga ggt gcc aag acc gag gca gct ggt gag | 1776 |
| Thr Ser Thr Leu Val Lys Arg Gly Ala Lys Thr Glu Ala Ala Gly Glu |      |
| 580 585 590   |      |
| cac cca tca aag cgg gtg aag gtt gaa gac agt gag ccc gga gtg gaa | 1824 |
| His Pro Ser Lys Arg Val Lys Val Glu Asp Ser Glu Pro Gly Val Glu |      |
| 595 600 605   |      |
| gac gaa gtg aag aaa tgc tat gcg aaa ggc act gtt tcc aag ctt acg | 1872 |
| Asp Glu Val Lys Lys Cys Tyr Ala Lys Gly Thr Val Ser Lys Leu Thr |      |
| 610 615 620   |      |
| gtg gcc gtg ctg aag gaa ttc ttg cat gca cat ggc cgt gct aca gca | 1920 |
| Val Ala Val Leu Lys Glu Phe Leu His Ala His Gly Arg Ala Thr Ala |      |
| 625 630 635 640   |      |
| gga aag aaa gca gat ctc gtg gac cga gtt gag cag tac ttt gag cag | 1968 |
| Gly Lys Lys Ala Asp Leu Val Asp Arg Val Glu Gln Tyr Phe Glu Gln |      |
| 645 650 655   |      |
| aag ttt taa   | 1977 |
| Lys Phe   |      |

&lt;210&gt; 20

&lt;211&gt; 658

&lt;212&gt; PRT

&lt;213&gt; Penicillium chrysogenum

&lt;400&gt; 20

|   |  |
|---|--|
| Met Val Glu Asp Ser Tyr Thr Arg Glu Glu Glu Asn Tyr Glu Asp Glu |  |
| 1 5 10 15   |  |
| Glu Leu Asp Glu Thr Ser Phe Lys Ser Val Lys Asp Ala Val Leu Phe |  |
| 20 25 30  |  |

Ala Ile Asp Ile Ser Ser Ser Met Leu Thr Pro Arg Pro Ser Pro Asp  
 35 40 45  
 Pro Lys Lys His Gly Asp Glu Ser Pro Ala Ser Ala Ala Leu Lys Cys  
 50 55 60  
 Ala Tyr His Leu Met Gln Gln Arg Ile Ile Ser Asn Pro His Asp Met  
 65 70 75 80  
 Ile Gly Val Leu Leu Tyr Gly Thr Gln Ser Ser Lys Phe Tyr Asp Glu  
 85 90 95  
 Asn Glu Asp Asp Arg Gly Asp Leu Ser Tyr Pro His Cys Tyr Leu Tyr  
 100 105 110  
 Thr Asp Leu Asp Val Pro Ser Ala Gln Glu Val Lys Gln Leu Arg Ser  
 115 120 125  
 Leu Ala Ser Pro Ala Asp Ala Asp Asp Val Leu Gln Val Leu Glu  
 130 135 140  
 Pro Ser Lys Glu Pro Ala Ser Met Ala Asn Met Leu Phe Cys Ala Asn  
 145 150 155 160  
 Gln Ile Phe Thr Ser Lys Ala Pro Asn Phe Ala Ser Arg Arg Leu Phe  
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 Val Val Thr Asp Asn Asp Asn Pro His Ala Asp Asn Lys Gly Met Arg  
 180 185 190  
 Ser Ala Ala Thr Val Arg Ala Arg Asp Leu Tyr Asp Leu Gly Val Asn  
 195 200 205  
 Ile Glu Leu Phe Pro Ile Ser Gln Pro Asp His Glu Phe Asp Thr Ser  
 210 215 220  
 Lys Phe Tyr Asp Asp Ile Ile Tyr Lys Thr Ser Pro Ser Asp Gly Asp  
 225 230 235 240  
 Ala Pro Ala Tyr Leu Gln Pro Asp Thr Asn Thr Ser Thr Ala Lys Gly  
 245 250 255  
 Asp Gly Leu Ser Leu Leu Asn Ser Leu Leu Ser Ser Ile Asn Ser Arg  
 260 265 270  
 Ser Val Pro Arg Arg Ser Leu Phe Ser Asn Val Pro Leu Glu Ile Gly  
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 Pro Asn Phe Lys Ile Ser Val Asn Gly Tyr Leu Leu Leu Lys Lys Gln  
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 Glu Pro Ala Arg Ser Cys Phe Val Trp Gln Gly Gly Glu Thr Ala Gln  
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 Ile Ala Lys Gly Val Thr Thr Leu Met Ser Asp Asp Thr Gly Gln Glu  
 325 330 335  
 Ile Glu Lys Ser Asp Ile Arg Lys Ala Tyr Lys Phe Gly Gly Glu Gln  
 340 345 350  
 Val Ser Phe Thr Ile Glu Glu Gln Gln Ala Leu Arg Ser Phe Gly Asp  
 355 360 365  
 Pro Val Ile Arg Ile Ile Gly Phe Lys Pro Leu Ser Ala Leu Pro Phe  
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 Trp Ala Asn Val Lys His Pro Ser Phe Ile Tyr Pro Ser Glu Glu Asp  
 385 390 395 400  
 Tyr Val Gly Ser Thr Arg Val Phe Ser Ala Leu His Gln Lys Leu Leu  
 405 410 415  
 Glu Ser Glu Lys Leu Ala Leu Val Trp Phe Ile Pro Arg Arg Asn Ala  
 420 425 430  
 Ser Pro Val Leu Ala Ala Met Ile Ala Gly Ala Glu Lys Ile Asp Glu  
 435 440 445  
 Asn Gly Val Gln Lys Ile Pro Pro Gly Met Trp Ile Ile Pro Leu Pro  
 450 455 460  
 Phe Ala Asp Asp Val Arg Gln Asn Pro Glu Ser Thr Val His Arg Ala  
 465 470 475 480  
 Gly Asp Ala Leu Asn Asp Ala Met Arg Asp Val Val Arg Gln Leu Gln

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |  |
| Leu | Pro | Lys | Ala | Val | Tyr | Asp | Pro | Ser | Lys | Tyr | Pro | Asn | Pro | Ser | Leu |  |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |  |
| Gln | Trp | His | Tyr | Arg | Ile | Leu | Gln | Ala | Ile | Ala | Leu | Asp | Glu | Asp | Phe |  |  |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |  |
| Pro | Glu | Ser | Pro | Asp | Asp | Lys | Thr | Val | Pro | Lys | Tyr | Arg | Gln | Val | His |  |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |  |
| Lys | Val | Gly | Cys | Phe | His | Asp | Pro | Arg | Asn | Ala | Arg | Thr | Trp | Ala | Glu |  |  |
| 545 |     |     |     |     | 550 |     |     |     | 555 |     |     |     |     |     | 560 |  |  |
| Glu | Leu | Lys | Leu | Gln | Ala | Ser | Glu | Met | Phe | Gly | Gly | Ser | Val | Ala | Ala |  |  |
|     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |     |  |  |
| Thr | Ser | Thr | Leu | Val | Lys | Arg | Gly | Ala | Lys | Thr | Glu | Ala | Ala | Gly | Glu |  |  |
|     |     |     | 580 |     |     |     | 585 |     |     |     |     |     | 590 |     |     |  |  |
| His | Pro | Ser | Lys | Arg | Val | Lys | Val | Glu | Asp | Ser | Glu | Pro | Gly | Val | Glu |  |  |
|     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |     |  |  |
| Asp | Glu | Val | Lys | Lys | Cys | Tyr | Ala | Lys | Gly | Thr | Val | Ser | Lys | Leu | Thr |  |  |
|     | 610 |     |     |     | 615 |     |     |     | 620 |     |     |     |     |     |     |  |  |
| Val | Ala | Val | Leu | Lys | Glu | Phe | Leu | His | Ala | His | Gly | Arg | Ala | Thr | Ala |  |  |
| 625 |     |     |     | 630 |     |     |     | 635 |     |     |     |     |     |     | 640 |  |  |
| Gly | Lys | Lys | Ala | Asp | Leu | Val | Asp | Arg | Val | Glu | Gln | Tyr | Phe | Glu | Gln |  |  |
|     |     |     | 645 |     |     |     | 650 |     |     |     |     |     | 655 |     |     |  |  |

Lys Phe

&lt;210&gt; 21

&lt;211&gt; 3605

&lt;212&gt; DNA

<213> *Penicillium chrysogenum*

&lt;400&gt; 21

|             |             |            |             |             |              |      |
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| gcatcgaggg  | gaagaagtgg  | cagttatcgc | tacgatccaa  | ttcttaatga  | aagccttatt   | 120  |
| tccacttcca  | aatagaggga  | gctggcttct | aacgacgcac  | agaccaccaa  | acac caacaa  | 180  |
| agacggcgtg  | tgatgtcatg  | tgccttcgtg | tttcgggtcta | aaccgcaagt  | ggaa atatca  | 240  |
| cgcgtctgcc  | tgttgtcttg  | agccccaaag | caactttgtc  | ttgccatttt  | ccca acatca  | 300  |
| tcatcattat  | ggcggagaaa  | gaggctacag | tttacattgt  | agacatggga  | cgggt ctatgg | 360  |
| gcgagcgcca  | ccatggccgt  | cctatgacag | atctcgaatg  | ggccatgcag  | tatgt tctggg | 420  |
| ataggatcac  | tgccacggta  | tgtgacttga | ccttgttcaa  | cgccagagaa  | ctga caattc  | 480  |
| caggtggcta  | ctggtcgaaa  | gacggctacg | gttggcgtag  | ttggactcag  | gact gatggg  | 540  |
| gagtggtcgg  | ctaccagtca  | gcacccattg | ggacccttgt  | ctcatgtttg  | gaac aggaac  | 600  |
| tatcaacgac  | ttggaagaag  | agagcttttc | taatatttct  | attctcttcg  | gtct tggcca  | 660  |
| gtatgtgtgg  | cttaattaat  | cgacagcttt | atgccgagtc  | gcctgactaa  | attgt tctttc | 720  |
| agagtcctca  | tgcctgatat  | ccggaaactg | cgagaaacga  | tcaagccag   | caac actaac  | 780  |
| agaggcgatg  | gtatgtgact  | gttgaagtct | tgtcaagctg  | cttattctga  | cttt atataa  | 840  |
| gccatctctt  | ctattgtcat  | tgccatgcag | atgatcattg  | actacacgaa  | gaaa aacaaa  | 900  |
| tacaagcgca  | agatcatctt  | ggtgaccaat | ggtaccggcg  | tgatgagcga  | tgat aatata  | 960  |
| gaaggcatca  | ttgaaaagat  | gaaagagggt | aacattgagt  | tggtgggtcat | gtat gtttct  | 1020 |
| tgccgacatg  | acttcacatt  | catgctaata | ctatgcagtg  | gagccgattt  | tgat gacgct  | 1080 |
| gagtatgggt  | ttaaaggaaga | agacaaagac | agtcgaaagg  | ttctaagcca  | tctc caatct  | 1140 |
| attctgttat  | tcatgttgac  | aaagcgctct | gcaggctgaa  | aacgagactt  | ttct ccgaag  | 1200 |
| cctggctgag  | gactgcgaag  | gtgcttatgg | aacgctggag  | caagccgttt  | cgga attgga  | 1260 |
| tattccccgt  | atcaaagtga  | ccaagagcat | gccatctttc  | aagggaaacc  | tcac gctcgg  | 1320 |
| caatcccagag | gagtatgaca  | cggctatgac | tatacccggtg | gagcgatact  | tccg aaccta  | 1380 |
| cgtcgccaaa  | ccaatctcag  | cgagctcggt | cgtaccacgc  | tccggcaccg  | aacc tggaag  | 1440 |
| tcaagcaccg  | gttaaaggcg  | atgctgaagg | cgatgctctc  | gcctcagtg   | gaac atcacg  | 1500 |
| gacgtatcag  | atcacagatg  | agtcgcgacc | aggtggtaag  | atcgacgttg  | aacg cgatga  | 1560 |
| cctcgccaag  | gggtacgagt  | acggacgtac | cgcggttcct  | atcgagcaaa  | ccga tgagaa  | 1620 |



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cagtattcgc tccagaaaac agcaaaagac cgagatttgc aaactcaaac attaaaaagc 3480
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<210> 22  
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 <213> *Penicillium chrysogenum*

<220>  
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1 5 10 15
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Met Gly Glu Arg His His Gly Arg Pro Met Thr Asp Leu Glu Trp Ala
20 25 30
atg cag tat gtc tgg gat agg atc act gcc acg gtg gct act ggt cga 144
Met Gln Tyr Val Trp Asp Arg Ile Thr Ala Thr Val Ala Thr Gly Arg
35 40 45
aag acg gct acg gtt ggc gta gtt gga ctc agg act gat gtc agc acc 192
Lys Thr Ala Thr Val Gly Val Val Gly Leu Arg Thr Asp Val Ser Thr

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|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 50 | cat | tgg | gac | cct | tgt | ctc | atg | ttt | gga | aca | gga | act | atc | aac | gac | ttg | 240  |
|    | His | Trp | Asp | Pro | Cys | Leu | Met | Phe | Gly | Thr | Gly | Thr | Ile | Asn | Asp | Leu |      |
| 65 |     |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |      |
|    | gaa | gaa | gag | agc | ttt | tct | aat | att | tct | att | ctc | ttc | ggg | ctt | ggc | caa | 288  |
|    | Glu | Glu | Glu | Ser | Phe | Ser | Asn | Ile | Ser | Ile | Leu | Phe | Gly | Leu | Gly | Gln |      |
|    |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |      |
|    | gtc | ctc | atg | cct | gat | atc | cgg | aaa | ctg | cga | gaa | acg | atc | aag | ccc | agc | 336  |
|    | Val | Leu | Met | Pro | Asp | Ile | Arg | Lys | Leu | Arg | Glu | Thr | Ile | Lys | Pro | Ser |      |
|    |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |      |
|    | aac | act | aac | aga | ggc | gat | gcc | atc | tct | tct | att | gtc | att | gcc | atg | cag | 384  |
|    | Asn | Thr | Asn | Arg | Gly | Asp | Ala | Ile | Ser | Ser | Ile | Val | Ile | Ala | Met | Gln |      |
|    |     |     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |      |
|    | atg | atc | att | gac | tac | acg | aag | aaa | aac | aaa | tac | aag | cgc | aag | atc | atc | 432  |
|    | Met | Ile | Ile | Asp | Tyr | Thr | Lys | Lys | Asn | Lys | Tyr | Lys | Arg | Lys | Ile | Ile |      |
|    |     |     |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |      |
|    | ttg | gtg | acc | aat | ggg | acc | ggc | gtg | atg | agc | gat | gat | aat | atc | gaa | ggc | 480  |
|    | Leu | Val | Thr | Asn | Gly | Thr | Gly | Val | Met | Ser | Asp | Asp | Asn | Ile | Glu | Gly |      |
|    | 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |      |
|    | atc | att | gaa | aag | atg | aaa | gag | gtt | aac | att | gag | ttg | gtg | gtc | atg | tat | 528  |
|    | Ile | Ile | Glu | Lys | Met | Lys | Glu | Val | Asn | Ile | Glu | Leu | Val | Val | Met | Tyr |      |
|    |     |     |     |     | 165 |     |     |     |     |     | 170 |     |     |     | 175 |     |      |
|    | tat | ggg | gta | aag | gaa | gaa | gac | aaa | gac | agt | cga | aag | gct | gaa | aac | gag | 576  |
|    | Tyr | Gly | Val | Lys | Glu | Glu | Asp | Lys | Asp | Ser | Arg | Lys | Ala | Glu | Asn | Glu |      |
|    |     |     |     |     | 180 |     |     |     |     |     | 185 |     |     |     | 190 |     |      |
|    | act | ttt | ctc | cga | agc | ctg | gct | gag | gac | tgc | gaa | ggg | gct | tat | gga | acg | 624  |
|    | Thr | Phe | Leu | Arg | Ser | Leu | Ala | Glu | Asp | Cys | Glu | Gly | Ala | Tyr | Gly | Thr |      |
|    |     |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |      |
|    | ctg | gag | caa | gcc | gtt | tcg | gaa | ttg | gat | att | ccc | cgt | atc | aaa | gtg | acc | 672  |
|    | Leu | Glu | Gln | Ala | Val | Ser | Glu | Leu | Asp | Ile | Pro | Arg | Ile | Lys | Val | Thr |      |
|    |     |     |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |      |
|    | aag | agc | atg | cca | tct | ttc | aag | gga | aac | ctc | acg | ctc | ggc | aat | ccc | gag | 720  |
|    | Lys | Ser | Met | Pro | Ser | Phe | Lys | Gly | Asn | Leu | Thr | Leu | Gly | Asn | Pro | Glu |      |
|    | 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |      |
|    | gag | tat | gac | acg | gct | atg | act | ata | ccc | gtg | gag | cga | tac | ttc | cga | acc | 768  |
|    | Glu | Tyr | Asp | Thr | Ala | Met | Thr | Ile | Pro | Val | Glu | Arg | Tyr | Phe | Arg | Thr |      |
|    |     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |      |
|    | tac | gtc | gcc | aaa | cca | atc | tca | gcg | agc | tcg | ttc | gta | cca | cgc | tcc | ggc | 816  |
|    | Tyr | Val | Ala | Lys | Pro | Ile | Ser | Ala | Ser | Ser | Phe | Val | Pro | Arg | Ser | Gly |      |
|    |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     |     | 270 |     |      |
|    | acc | gaa | cct | gga | agt | caa | gca | ccg | gtt | aaa | ggc | gat | gct | gaa | ggc | gat | 864  |
|    | Thr | Glu | Pro | Gly | Ser | Gln | Ala | Pro | Val | Lys | Gly | Asp | Ala | Glu | Gly | Asp |      |
|    |     |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |      |
|    | gct | ctc | gcc | tca | gtg | cga | aca | tca | cgg | acg | tat | cag | atc | aca | gat | gag | 912  |
|    | Ala | Leu | Ala | Ser | Val | Arg | Thr | Ser | Arg | Thr | Tyr | Gln | Ile | Thr | Asp | Glu |      |
|    |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |      |
|    | tcc | gca | cca | ggg | ggg | aag | atc | gac | gtt | gaa | cgc | gat | gac | ctc | gcc | aag | 960  |
|    | Ser | Ala | Pro | Gly | Gly | Lys | Ile | Asp | Val | Glu | Arg | Asp | Asp | Leu | Ala | Lys |      |
|    | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |      |
|    | ggg | tac | gag | tac | gga | cgt | acc | gcg | gtt | cct | atc | gag | caa | acc | gat | gag | 1008 |
|    | Gly | Tyr | Glu | Tyr | Gly | Arg | Thr | Ala | Val | Pro | Ile | Glu | Gln | Thr | Asp | Glu |      |
|    |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |      |
|    | aat | gtt | gca | aat | cta | caa | aca | ttt | gct | ggg | atg | ggg | ctg | atc | ggg | ttc | 1056 |
|    | Asn | Val | Ala | Asn | Leu | Gln | Thr | Phe | Ala | Gly | Met | Gly | Leu | Ile | Gly | Phe |      |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |      |
|    | gtt | cag | aag | gat | cag | tat | gac | cgg | tac | atg | cat | atg | tca | aac | acg | aat | 1104 |
|    | Val | Gln | Lys | Asp | Gln | Tyr | Asp | Arg | Tyr | Met | His | Met | Ser | Asn | Thr | Asn |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| atc | atc | atc | cct | cag | cgt | gca | aat | gac | tat | gcg | tct | ctt | gcg | ttg | tct | 1152 |
| Ile | Ile | Ile | Pro | Gln | Arg | Ala | Asn | Asp | Tyr | Ala | Ser | Leu | Ala | Leu | Ser |      |
|     | 370 |     |     |     |     | 375 |     |     |     | 380 |     |     |     |     |     |      |
| tct | ctc | att | cat | gca | ctc | tac | gaa | ttg | gag | tcc | tat | gcg | gtt | gcc | cgc | 1200 |
| Ser | Leu | Ile | His | Ala | Leu | Tyr | Glu | Leu | Glu | Ser | Tyr | Ala | Val | Ala | Arg |      |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |      |
| ttg | gtg | acc | aaa | gaa | tcc | aaa | cca | ccg | atg | ctt | gtg | ttg | cta | gct | cca | 1248 |
| Leu | Val | Thr | Lys | Glu | Ser | Lys | Pro | Pro | Met | Leu | Val | Leu | Leu | Ala | Pro |      |
|     |     |     | 405 |     |     |     |     |     | 410 |     |     |     |     | 415 |     |      |
| tct | atc | gag | gca | gac | tat | gag | tgc | ttg | att | gaa | gta | cag | ctt | cca | ttt | 1296 |
| Ser | Ile | Glu | Ala | Asp | Tyr | Glu | Cys | Leu | Ile | Glu | Val | Gln | Leu | Pro | Phe |      |
|     |     |     | 420 |     |     |     | 425 |     |     |     |     |     | 430 |     |     |      |
| gca | gaa | gac | gtg | cgg | tcg | tat | cgg | ttc | cca | cct | ttg | gat | aag | att | atc | 1344 |
| Ala | Glu | Asp | Val | Arg | Ser | Tyr | Arg | Phe | Pro | Pro | Leu | Asp | Lys | Ile | Ile |      |
|     | 435 |     |     |     |     | 440 |     |     |     | 445 |     |     |     |     |     |      |
| act | gtc | tct | ggc | aag | gtg | gtg | act | gaa | cat | cga | aac | ctc | cca | agc | gtg | 1392 |
| Thr | Val | Ser | Gly | Lys | Val | Val | Thr | Glu | His | Arg | Asn | Leu | Pro | Ser | Val |      |
| 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |     |      |
| gcg | ttg | aaa | gat | gcg | atg | agt | aac | tac | gtg | gac | agc | atg | gat | ttt | gtc | 1440 |
| Ala | Leu | Lys | Asp | Ala | Met | Ser | Asn | Tyr | Val | Asp | Ser | Met | Asp | Phe | Val |      |
| 465 |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |     |      |
| acc | aca | aac | gac | gaa | ggg | caa | gcc | act | gac | gat | ctc | cca | atc | gac | gag | 1488 |
| Thr | Thr | Asn | Asp | Glu | Gly | Gln | Ala | Thr | Asp | Asp | Leu | Pro | Ile | Asp | Glu |      |
|     |     |     | 485 |     |     |     |     |     | 490 |     |     |     |     | 495 |     |      |
| tca | ttc | tca | ccg | tta | ttg | cac | cgc | atc | gaa | tca | gca | gtt | cga | tat | cgt | 1536 |
| Ser | Phe | Ser | Pro | Leu | Leu | His | Arg | Ile | Glu | Ser | Ala | Val | Arg | Tyr | Arg |      |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     |     | 510 |     |      |
| gct | gtg | cat | ccc | aat | gac | cct | gtc | ctc | gac | ccc | tca | gag | cgg | ctc | act | 1584 |
| Ala | Val | His | Pro | Asn | Asp | Pro | Val | Leu | Asp | Pro | Ser | Glu | Arg | Leu | Thr |      |
|     | 515 |     |     |     |     | 520 |     |     |     | 525 |     |     |     |     |     |      |
| gaa | ttc | gca | cac | ccc | tca | gaa | gac | atg | gtc | aag | aac | tcc | aaa | tcc | cat | 1632 |
| Glu | Phe | Ala | His | Pro | Ser | Glu | Asp | Met | Val | Lys | Asn | Ser | Lys | Ser | His |      |
| 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |     |      |
| ctt | gag | aaa | ttg | atg | tcc | ata | gca | gat | gtc | aag | aaa | gtt | cca | ccg | aag | 1680 |
| Leu | Glu | Lys | Leu | Met | Ser | Ile | Ala | Asp | Val | Lys | Lys | Val | Pro | Pro | Lys |      |
| 545 |     |     |     |     | 550 |     |     |     | 555 |     |     |     |     | 560 |     |      |
| aca | aaa | ggc | cgt | aaa | cgc | caa | cgt | gaa | aca | gag | aaa | cct | ctc | tca | ggt | 1728 |
| Thr | Lys | Gly | Arg | Lys | Arg | Gln | Arg | Glu | Thr | Glu | Lys | Pro | Leu | Ser | Gly |      |
|     |     |     | 565 |     |     |     |     | 570 |     |     |     |     |     | 575 |     |      |
| ttg | gac | gtg | gac | gcc | ctg | ctc | agc | ctc | gaa | ccc | aag | cga | acg | aag | att | 1776 |
| Leu | Asp | Val | Asp | Ala | Leu | Leu | Ser | Leu | Glu | Pro | Lys | Arg | Thr | Lys | Ile |      |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     |     | 590 |     |      |
| tcc | acc | gag | aat | gca | atc | cca | gag | ttc | aag | caa | aca | ctt | tcc | cgc | gcg | 1824 |
| Ser | Thr | Glu | Asn | Ala | Ile | Pro | Glu | Phe | Lys | Gln | Thr | Leu | Ser | Arg | Ala |      |
|     | 595 |     |     |     |     | 600 |     |     |     |     |     |     |     |     |     |      |
| gaa | aac | atc | gac | gca | atc | cac | gac | gct | gtg | cag | cag | atg | gct | aaa | atc | 1872 |
| Glu | Asn | Ile | Asp | Ala | Ile | His | Asp | Ala | Val | Gln | Gln | Met | Ala | Lys | Ile |      |
| 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |     |      |
| atc | gag | agc | cag | atc | aca | cac | agc | ctc | ggt | cat | tca | aat | tac | gac | cgt | 1920 |
| Ile | Glu | Ser | Gln | Ile | Thr | His | Ser | Leu | Gly | His | Ser | Asn | Tyr | Asp | Arg |      |
| 625 |     |     |     |     | 630 |     |     |     | 635 |     |     |     |     | 640 |     |      |
| ggt | atc | gag | ggg | ctt | ggt | act | atg | cgt | gaa | gaa | ctg | gtg | gac | tat | gag | 1968 |
| Val | Ile | Glu | Gly | Leu | Gly | Thr | Met | Arg | Glu | Glu | Leu | Val | Asp | Tyr | Glu |      |
|     |     |     | 645 |     |     |     |     | 650 |     |     |     |     |     | 655 |     |      |
| gaa | ccg | gcg | gtg | tac | aat | gac | ttt | gtg | cgt | cag | ttg | aag | ggc | aag | atg | 2016 |
| Glu | Pro | Ala | Val | Tyr | Asn | Asp | Phe | Val | Arg | Gln | Leu | Lys | Gly | Lys | Met |      |



|   |     |     |      |
|---|-----|-----|------|
| 660   | 665 | 670 |      |
| ttg cgg gag gag ctg ggt ggg gat cgg agg gag ctg tgg tgg ttt gta |     |     | 2064 |
| Leu Arg Glu Glu Leu Gly Gly Asp Arg Arg Glu Leu Trp Trp Phe Val |     |     |      |
| 675   | 680 | 685 |      |
| agg aag gga aag ctt ggg ctc att ggc aag agt gag gtg gat agc tcg |     |     | 2112 |
| Arg Lys Gly Lys Leu Gly Leu Ile Gly Lys Ser Glu Val Asp Ser Ser |     |     |      |
| 690   | 695 | 700 |      |
| gct gtt gag gag caa gag gct caa gag ttt ctg gct ccc aat tga     |     |     | 2157 |
| Ala Val Glu Glu Gln Glu Ala Gln Glu Phe Leu Ala Pro Asn         |     |     |      |
| 705   | 710 | 715 |      |

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 <211> 718  
 <212> PRT  
 <213> *Penicillium chrysogenum*

<400> 23  
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 20 25 30  
 Met Gln Tyr Val Trp Asp Arg Ile Thr Ala Thr Val Ala Thr Gly Arg  
 35 40 45  
 Lys Thr Ala Thr Val Gly Val Val Gly Leu Arg Thr Asp Val Ser Thr  
 50 55 60  
 His Trp Asp Pro Cys Leu Met Phe Gly Thr Gly Thr Ile Asn Asp Leu  
 65 70 75 80  
 Glu Glu Glu Ser Phe Ser Asn Ile Ser Ile Leu Phe Gly Leu Gly Gln  
 85 90 95  
 Val Leu Met Pro Asp Ile Arg Lys Leu Arg Glu Thr Ile Lys Pro Ser  
 100 105 110  
 Asn Thr Asn Arg Gly Asp Ala Ile Ser Ser Ile Val Ile Ala Met Gln  
 115 120 125  
 Met Ile Ile Asp Tyr Thr Lys Lys Asn Lys Tyr Lys Arg Lys Ile Ile  
 130 135 140  
 Leu Val Thr Asn Gly Thr Gly Val Met Ser Asp Asp Asn Ile Glu Gly  
 145 150 155 160  
 Ile Ile Glu Lys Met Lys Glu Val Asn Ile Glu Leu Val Val Met Tyr  
 165 170 175  
 Tyr Gly Val Lys Glu Glu Asp Lys Asp Ser Arg Lys Ala Glu Asn Glu  
 180 185 190  
 Thr Phe Leu Arg Ser Leu Ala Glu Asp Cys Glu Gly Ala Tyr Gly Thr  
 195 200 205  
 Leu Glu Gln Ala Val Ser Glu Leu Asp Ile Pro Arg Ile Lys Val Thr  
 210 215 220  
 Lys Ser Met Pro Ser Phe Lys Gly Asn Leu Thr Leu Gly Asn Pro Glu  
 225 230 235 240  
 Glu Tyr Asp Thr Ala Met Thr Ile Pro Val Glu Arg Tyr Phe Arg Thr  
 245 250 255  
 Tyr Val Ala Lys Pro Ile Ser Ala Ser Ser Phe Val Pro Arg Ser Gly  
 260 265 270  
 Thr Glu Pro Gly Ser Gln Ala Pro Val Lys Gly Asp Ala Glu Gly Asp  
 275 280 285  
 Ala Leu Ala Ser Val Arg Thr Ser Arg Thr Tyr Gln Ile Thr Asp Glu  
 290 295 300  
 Ser Ala Pro Gly Gly Lys Ile Asp Val Glu Arg Asp Asp Leu Ala Lys

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     | 320 |     |
| Gly | Tyr | Glu | Tyr | Gly | Arg | Thr | Ala | Val | Pro | Ile | Glu | Gln | Thr | Asp | Glu |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Asn | Val | Ala | Asn | Leu | Gln | Thr | Phe | Ala | Gly | Met | Gly | Leu | Ile | Gly | Phe |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     | 350 |     |     |     |
| Val | Gln | Lys | Asp | Gln | Tyr | Asp | Arg | Tyr | Met | His | Met | Ser | Asn | Thr | Asn |
|     |     | 355 |     |     |     | 360 |     |     |     |     | 365 |     |     |     |     |
| Ile | Ile | Ile | Pro | Gln | Arg | Ala | Asn | Asp | Tyr | Ala | Ser | Leu | Ala | Leu | Ser |
|     | 370 |     |     |     | 375 |     |     |     | 380 |     |     |     |     |     |     |
| Ser | Leu | Ile | His | Ala | Leu | Tyr | Glu | Leu | Glu | Ser | Tyr | Ala | Val | Ala | Arg |
| 385 |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |     |
| Leu | Val | Thr | Lys | Glu | Ser | Lys | Pro | Pro | Met | Leu | Val | Leu | Leu | Ala | Pro |
|     |     |     | 405 |     |     |     |     | 410 |     |     |     |     |     | 415 |     |
| Ser | Ile | Glu | Ala | Asp | Tyr | Glu | Cys | Leu | Ile | Glu | Val | Gln | Leu | Pro | Phe |
|     |     | 420 |     |     |     | 425 |     |     |     |     |     | 430 |     |     |     |
| Ala | Glu | Asp | Val | Arg | Ser | Tyr | Arg | Phe | Pro | Pro | Leu | Asp | Lys | Ile | Ile |
|     | 435 |     |     |     |     | 440 |     |     |     |     |     | 445 |     |     |     |
| Thr | Val | Ser | Gly | Lys | Val | Val | Thr | Glu | His | Arg | Asn | Leu | Pro | Ser | Val |
|     | 450 |     |     |     | 455 |     |     |     |     |     | 460 |     |     |     |     |
| Ala | Leu | Lys | Asp | Ala | Met | Ser | Asn | Tyr | Val | Asp | Ser | Met | Asp | Phe | Val |
| 465 |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |     |
| Thr | Thr | Asn | Asp | Glu | Gly | Gln | Ala | Thr | Asp | Asp | Leu | Pro | Ile | Asp | Glu |
|     |     |     | 485 |     |     |     |     | 490 |     |     |     |     |     | 495 |     |
| Ser | Phe | Ser | Pro | Leu | Leu | His | Arg | Ile | Glu | Ser | Ala | Val | Arg | Tyr | Arg |
|     |     | 500 |     |     |     | 505 |     |     |     |     |     | 510 |     |     |     |
| Ala | Val | His | Pro | Asn | Asp | Pro | Val | Leu | Asp | Pro | Ser | Glu | Arg | Leu | Thr |
|     | 515 |     |     |     |     | 520 |     |     |     |     |     | 525 |     |     |     |
| Glu | Phe | Ala | His | Pro | Ser | Glu | Asp | Met | Val | Lys | Asn | Ser | Lys | Ser | His |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Leu | Glu | Lys | Leu | Met | Ser | Ile | Ala | Asp | Val | Lys | Lys | Val | Pro | Pro | Lys |
| 545 |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |     |
| Thr | Lys | Gly | Arg | Lys | Arg | Gln | Arg | Glu | Thr | Glu | Lys | Pro | Leu | Ser | Gly |
|     |     |     | 565 |     |     |     |     | 570 |     |     |     |     |     | 575 |     |
| Leu | Asp | Val | Asp | Ala | Leu | Leu | Ser | Leu | Glu | Pro | Lys | Arg | Thr | Lys | Ile |
|     |     | 580 |     |     |     | 585 |     |     |     |     |     | 590 |     |     |     |
| Ser | Thr | Glu | Asn | Ala | Ile | Pro | Glu | Phe | Lys | Gln | Thr | Leu | Ser | Arg | Ala |
|     | 595 |     |     |     |     | 600 |     |     |     |     |     | 605 |     |     |     |
| Glu | Asn | Ile | Asp | Ala | Ile | His | Asp | Ala | Val | Gln | Gln | Met | Ala | Lys | Ile |
|     | 610 |     |     |     | 615 |     |     |     |     |     | 620 |     |     |     |     |
| Ile | Glu | Ser | Gln | Ile | Thr | His | Ser | Leu | Gly | His | Ser | Asn | Tyr | Asp | Arg |
| 625 |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |     |
| Val | Ile | Glu | Gly | Leu | Gly | Thr | Met | Arg | Glu | Glu | Leu | Val | Asp | Tyr | Glu |
|     |     |     | 645 |     |     |     |     | 650 |     |     |     |     |     | 655 |     |
| Glu | Pro | Ala | Val | Tyr | Asn | Asp | Phe | Val | Arg | Gln | Leu | Lys | Gly | Lys | Met |
|     |     | 660 |     |     |     | 665 |     |     |     |     |     | 670 |     |     |     |
| Leu | Arg | Glu | Glu | Leu | Gly | Gly | Asp | Arg | Arg | Glu | Leu | Trp | Trp | Phe | Val |
|     | 675 |     |     |     |     | 680 |     |     |     |     |     | 685 |     |     |     |
| Arg | Lys | Gly | Lys | Leu | Gly | Leu | Ile | Gly | Lys | Ser | Glu | Val | Asp | Ser | Ser |
|     | 690 |     |     |     | 695 |     |     |     |     |     | 700 |     |     |     |     |
| Ala | Val | Glu | Glu | Gln | Glu | Ala | Gln | Glu | Phe | Leu | Ala | Pro | Asn |     |     |
| 705 |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     |     |     |